

*European Partnership under Horizon Europe*

*Agriculture of Data*

*Version 29 March 2022*

## Table of Contents

1. Executive Summary .....	4
1.1 Context .....	4
1.2 Problem definition.....	5
1.3 Vision .....	5
1.4 Objectives.....	5
1.5 Expected Impacts .....	6
1.6 Necessity for a European Partnership .....	7
1.7 Partner composition and target group .....	7
1.8 Planned Implementation.....	8
2. General information .....	9
2.1 Draft title of the European Partnership .....	9
2.2 Lead entity (main contact).....	9
2.3 Commission services (main contact).....	9
2.4 Summary .....	9
3. Context, objectives, expected impacts .....	10
3.1 Context and problem definition.....	10
3.1.1 Context.....	10
3.1.2 Problem definition .....	13
3.2 Common vision, objectives and expected impacts.....	16
3.2.1 Scope.....	16
3.2.2 Vision and objectives .....	16
3.2.3 Expected Impacts .....	18
3.2.4 Intervention logic .....	19
3.2.5 The way towards a Strategic Research and Innovation Agenda (SRIA) and expected transformation of R&I .....	21
3.2.6 Possible links to other Horizon Europe partnerships and Missions.....	23
3.2.7 Investments/Resources.....	24
3.2.8 Exit Strategy.....	24
3.3 Necessity for a European Partnership .....	24
3.3.1 Addressing European and global challenges .....	24
3.3.2 Contribution to policy priorities.....	25
3.3.3 The need for the use of the partnership instrument.....	30
3.3.4 Expected EU added value .....	30
3.4 Partner composition and target group .....	31
3.4.1 Building on and expanding existing cooperation.....	31
3.4.2 Type and composition of necessary partners (including new partners).....	31
3.4.3 Target groups and stakeholder community beyond the partners .....	33

3.4.4	International dimension .....	34
4.	Planned Implementation .....	36
4.1	Activities .....	36
4.1.1	Portfolio of activities.....	36
4.1.2	Complementarity with other activities at EU level.....	39
4.1.3	Achieving coherence and synergies with national policies, programmes and activities .....	43
4.2	Resources .....	45
4.2.1	Type and level of contribution of the partnership.....	45
4.2.2	Other forms of resources foreseen .....	48
4.3	Exit strategy.....	49
4.3.1	Why an exit strategy/the ambition to sustain the partnership and its achievements	49
4.3.2	How to set up the exit strategy.....	49
4.4	Governance.....	50
4.5	Openness and transparency .....	54
4.5.1	Transparency in the development process of the partnership .....	54
4.5.2	Transparency in the lifetime of the partnership .....	55
	ANNEXES.....	60
	ANNEX I – Overview of Core group members .....	61
	ANNEX II – List of relevant EU funded projects (including H2020).....	62
	ANNEX III – Preliminary list of key R&I fields of action and perspectives to be addressed in the SRIA development process .....	63
	ANNEX IV – Partnership process .....	68
	ANNEX V – List of acronyms.....	70

# 1. Executive Summary

## 1.1 Context

In line with the European Green Deal, and Farm to Fork Strategies, **agricultural production** in Europe aims/needs to become **more sustainable**. The agri-environmental (environmental and climate) performance needs to increase, while guaranteeing the profitability, efficiency and competitiveness of the farming sector and managing the growing operational risks (e.g. due to climate change). At the same time, EU policies, including the Common Agricultural Policy (CAP), are becoming more performance-oriented, requiring **efficient and effective policy monitoring** and subsequent evaluation of the impact achieved.

**Digital and data technologies** have the potential to achieve both these ambitious goals (sustainable agricultural production and more evidence-based and tailored policy) and make the “twin” green and digital transition a reality. For this, an essential ingredient is data in high quality and quantity, as reflected in the European Strategy for Data<sup>1</sup>. Combining these technologies with other environmental and agricultural **data**<sup>2</sup> offers a wide-range of opportunities for new and innovative developments which can further boost agri-environmental performance and strengthen policy-making, implementation and monitoring capacities.

The **Horizon Europe Partnership “Agriculture of Data” (AgData)** aims to support a sustainable agriculture in Europe as well as strengthening policy monitoring and evaluation capacities, by using the potential that digital and data technologies in combination with Earth observation (EO) and other environmental and agricultural data offer. The partnership will contribute to – among others - the objectives of the European Green Deal and the Headline ambition of “A Europe fit for the Digital Age”, those of the Farm-to Fork Strategy<sup>3</sup>, the Europe Strategy for Data and the Coordinated Plan for Artificial Intelligence (AI)<sup>4</sup> in particular, as well as to the objectives of the CAP, the United Nations’ Sustainable Development Goals<sup>5</sup> and the ambition of better policy-making.

Copernicus, the EO and monitoring part of the EU Space programme, is one important reference in the context of data for the AgData partnership. Copernicus helps, for instance, to implement the Common Agricultural Policy (CAP) as it can provide important land-monitoring parameters. Satellite data in general also provide important information for agricultural production. To capitalise on EO data in particular, **reference data sets** are key assets e.g. *in-situ* data or data from the Integrated Administration and Control System (IACS). Also, the huge amount of **agricultural sensor data** captured for managing farms as well as **other agricultural data sets**, are of great value for the improved interpretation and upscaling of Earth and environmental observation data. High potential is seen in the use of data generated through (precision) farming to be used as reference data to capitalise satellite data through the application of data technologies. Therefore, the cooperation with the farming and machinery sectors are not only essential to ensure uptake of the data-based solutions of the partnership. Finally, the creation of **Europe-wide data sets** will add another important asset to both **policy monitoring and evaluation** and might be the ‘game-changer’ in **increasing the sector’s**

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<sup>1</sup> [Strategy for Data | Shaping Europe’s digital future \(europa.eu\)](#)

<sup>2</sup> The scope of “data” in this partnership refers to all kind of data that are relevant to achieve the objectives of the Partnership Agriculture of Data. This includes geospatial observations (e.g. environmental and Earth observation) and agricultural data (public and private data including e.g., farm data, IACS data held by paying agencies, socio-economic as well as modelled data).

<sup>3</sup> [Farm to Fork Strategy \(europa.eu\)](#)

<sup>4</sup> [Plan on AI | Shaping Europe’s digital future \(europa.eu\)](#)

<sup>5</sup> [Sustainable Development Goals | United Nations Development Programme \(undp.org\)](#)

**performance** in the successful implementation of climate change adaptation and mitigation strategies.

## 1.2 Problem definition

Combining the sustainability ambitions in agriculture and unlocking the potential of digital and data technologies and Earth observations, to increase the performance of the agriculture sector and to support policy monitoring and evaluation is extremely challenging and the most important bottlenecks have been identified:

- Moderate end-user uptake of digital and data technologies due to unclear cost benefits, low resolution of imagery and lack of technical skills;
- Digital divide between farms due to different investment capacities in digital technology;
- Poor data availability for efficient policy monitoring & evaluation;
- Lack of reference data sets to capitalise Earth and environmental observation data through the use of data technologies;
- Scarcity in adoption of big data solutions for agricultural applications;
- Difficulties for farmers to take control of their data;
- Insufficient data interoperability and missing state-of-the-art cybersecurity protection mechanisms and Privacy enforcement technologies.

## 1.3 Vision

This partnership envisions a highly competitive European agriculture sector that is environmentally- and socio-economically-sustainable, supported by improved capacities for policy monitoring and evaluation.

To make this a reality the combined use of EO, environmental and other relevant data, such as agricultural production and sensor data through data and digital technologies is the key asset. This will be unlocked by codesigning common approaches and systems as well as sustainable structures to capitalise the combination of EO, other environmental and agricultural data for both the private and public domain. The partnership targets in particular on farmers/agricultural producers and on policy-makers and the public administrations.

## 1.4 Objectives

This partnership aims to enhance climate, environmental and socio-economic sustainability and productivity of agriculture and to strengthen policy monitoring and evaluation capacities, through exploiting the potential of EO, other environmental and agricultural data, in combination with data technologies.

To achieve this general objective the following specific objectives are defined (see also Figure 2 on page 19 on how they are embedded into the overall intervention logic and how relate to the expected impacts):

1. Improve agri-environmental monitoring tools and strengthen capacities to assess the status of agri-environmental and climatic conditions particularly by enhancing the integration of data sets provided by various platforms/networks.
2. Boost the uptake of digital & data technologies in agriculture, by providing tailored, easily accessible end-user-oriented data-based solutions building on EO and other environmental data.
3. Promote the use of EO, environmental and other data as well as digital & data technologies to improve climate adaptation and resilience of agriculture and to minimise undesired impact of agriculture on the climate, environment and biodiversity.
4. Achieve synergies in the development and utilisation of data-based solutions for both the agriculture sector and policy monitoring/evaluation.
5. Facilitate the use and reuse of EO, environmental and other data to create tools and services that can be easily adopted by farmers, organisations and businesses and to achieve a wide and rapid outreach of the benefits of their use.

## 1.5 Expected Impacts

The partnership has the following **expected impacts** under three complementary impact categories: 1. Scientific, 2. Societal (incl. environmental) and 3. Economic & technological<sup>6</sup>.

### **Scientific**

- a) Increased synergies between and better integration of different actors (e.g. scientists, technicians, policy-makers, practitioners, businesses, farmers, end users) achieved in the digital Earth, environmental observation and agricultural communities within Europe, transforming both the R&I and economic ecosystem to deliver more and better data-based solutions to the end users.

### **Societal (incl. environmental)**

- b) Increased environmental, climate and socio-economical sustainability performance of the agriculture sector.
- c) Enhanced contribution from the agriculture sector to the important need for protecting the environment, halting and, if possible, reversing biodiversity loss in Europe and globally, as well as to the reduction of the emission of greenhouse gasses from agriculture.
- d) Enabling the sector and strengthen its capacity to adapt to climate change and to meet the objectives set by sustainability-related policies, considering e.g. risk analyses/indicators, such as environmental, technical, economic or social risks.

### **Economic & Technological**

- e) Contribution to creating an institutional structure that includes a data infrastructure needed to provide data-based solutions for both policy-making and the agriculture sector (including to strengthening the sector’s economic performance).
- f) Strengthened capacities to evaluate the effectiveness of policies (with reference to agriculture, environmental- and market-related policies and the combined potential effects of them).

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<sup>6</sup> The three impact categories align with those set out in [Annex V of the Horizon Europe Regulation](#).

## 1.6 Necessity for a European Partnership

A European Partnership in the area of data and digital & data technologies in agriculture is warranted because multiple challenges in this area exist at a European scale, including an increased demand for sustainability of the sector, adaptation to climate change, avoiding digital divides and capitalising data in a fair manner. These challenges can only be effectively addressed by concerted actions at the European level. Action at a European level would facilitate the coordination with European policies and programmes. The data produced by the partnership can be used in the monitoring of policies, demonstrating policy performance and facilitating the tailoring of policies which is vital to ensure the effective use of public funds.

The partnership instrument is particularly suited to this area, as a partnership has the possibility of sustaining and maintaining achievements through a longer funding cycle and after the funded lifetime, leading to a greater long-term impact. In addition, a partnership can go beyond ‘normal’ Horizon Europe Work Programme topics in coverage, outreach and achievements; within its systemic architecture it can embed more actions than ‘only’ calls and it allows for setting up Strategic framing actions such as ensuring consistency across Europe in data sets and approaches.

The AgData partnership is expected to create significant European added value. It will create an "umbrella effect" consolidating existing use cases and pilot projects in the field of the development of data-based solutions for the agriculture sector and policy monitoring. The partnership will contribute to “Defragmentation of the landscapes” initiatives in the field of EO, other environmental and agricultural data, which are currently frequently ongoing in parallel. It will contribute to "systemic effects" in the provision of data-based solutions through – among others- the upscaling of piloted approaches and the creation of sustainable governance and service structures. Due to its geographical outreach, this partnership will achieve the “critical mass” of the provision of (geospatial) reference data sets needed for the effective application of “Big data” technologies. The partnership will cover several biogeographic zones which will be a key asset for the development of a climate adaptation approach for the sector - lessons learned today in one region may be relevant in the coming years for other regions. Finally, due to the direct involvement of all/the majority of Member States in the partnership, the uptake of the results of the partnership and their integration into monitoring and evaluation processes of Common policies, will be facilitated.

## 1.7 Partner composition and target group

The AgData partnership aims to foster inter- and multi-disciplinary research and innovation activities in four domains: 1) agricultural production/farmers and 2) policy-monitoring and evaluation, on end-user side, and 3) Earth observation, other environmental and agricultural data, and 4) digital and data technologies, as means. It can build upon existing cooperation in many activities ongoing over the last decade creating a wide variety of partners and networking possibilities. Starting to build on what is already out there, the partnership will expand to interact with new types of partners - both private and public ones - and enable innovative working methods equally relevant for the different domains.

Member State and Associated Countries can become partners and mandate services like ministries of agriculture, research & innovation agencies, environmental protection agencies, paying agencies, RPO’s and national space agencies.

Besides the partners, it is extremely important to actively involve stakeholders from the related value chains including data providers. The need for integration of agricultural data links strongly with commercial actors that generate and provide this data to farmers. Advisory

services, machinery companies, suppliers of farm inputs, processors, data platforms and farm management information systems have a role to play in capitalising on the data.

It is essential to reflect this complex system of relevant actors in the governance of the partnership to ensure a proper representation of interest groups in the bodies and actions of the partnership of all of the four domains.

## 1.8 Planned Implementation

For the implementation of the AgData partnership, two main types of activities can be differentiated a) Core actions, and b) Strategic framing actions. These actions are supplemented by management, governance, administrative and communication/outreach and networking actions. The Core actions cover in particular, Research and Innovation (R&I) activities launched through the external and internal calls. This partnership also follows the ambition of upscaling and delivering end-user tailored innovative data-based solutions.<sup>6</sup> The Strategic framing actions to be carried out by partnering countries will form an essential corner stone of the work of this partnership; and may include, for example, the generation, provision and formatting of reference data sets. The Strategic framing actions are likely to be achieved primarily through in-kind contributions or internal calls. They are essential to ensure and increase effectiveness of the Core actions carried out under the partnership.

Achieving complementarity with other EU activities and their synergetic capitalisation is an inherent ambition of the AgData partnership. Therefore, the partnership will not dedicate special attention to the development of standards, but rather aim for synergies with corresponding EU level initiatives. Next to relevant R&I activities under Horizon Europe, other activities in the field of agriculture and environment supported under the Digital Europe Programme, and innovation- and knowledge related activities carried out under the Common Agricultural Policy (CAP), the EU Space Programme or carried out by bodies operating at EU/European level are to be considered. The partnership will also work to achieve coherence and synergies with national policies, programmes and activities.

As soon as the partnership document will be delivered by the Core group to the Commission a timetable of future planned activities foreseen for the preparation of the Strategic Research and Innovation Agenda (SRIA) will be agreed by the Core group members. This document outlines the roadmap to further elaborate the SRIA.

The EU envisage a contribution of € 100 million over the lifetime of the partnership, which would require co-funding from Member States and Associated Countries of € 233 million, leading to a total budget of € 333 million over 7 years. It is expected that countries' contribution will be a mixture of cash and "in-kind" contribution.



## 2. General information

### 2.1 Draft title of the European Partnership

Agriculture of Data

### 2.2 Lead entity (main contact)

Lead entities (Co-chairs of the Core group of country representatives):

- National Research Council of Italy (Nicola Pirrone)
- Barcelona Supercomputing Center (BSC), Spain (Nube Gonzalez-Reviriego)<sup>7</sup>
- University of Malaga, José Francisco Aldana<sup>8</sup>
- Danish Agricultural Agency (Jesper Stendal Sørensen)

### 2.3 Commission services (main contact)

Lead entities:

- RTD.B3 (Marjan van Meerloo, Jan Ramboer),
- AGRI.F2 (Doris Marquardt, Valerio Abbadessa)

Contact : [AGRI-DATA-RI-PARTNERSHIP@ec.europa.eu](mailto:AGRI-DATA-RI-PARTNERSHIP@ec.europa.eu)

### 2.4 Summary

This Horizon Europe partnership aims to support sustainable agriculture in Europe as well as policy monitoring and implementation, by using the possibilities that digital and data technologies in combination with environmental observation and other data offer.

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<sup>7</sup> Co-chair from 1. October 2021 – 31. December 2021

<sup>8</sup> Co-chair from 15. January 2022 onwards

## 3. Context, objectives, expected impacts

### 3.1 Context and problem definition

#### 3.1.1 Context

Agriculture provides food, feed, fibre, biomaterials and a wide range of ecosystem services, but the land use in the sector also affects the environment in various ways. It contributes to climate change (e.g. to global GHG emissions)<sup>9</sup>, it influences ecosystems (including its functioning soil and water) and biodiversity<sup>10</sup>, and shapes the cultural landscape. Agriculture provides employment, income and livelihood for the rural population.

Agriculture is important for producing sufficient food and ensuring healthy nutrition. However, there is an increasing demand to produce food in a more sustainable manner and for a growing population, with **improved environmental and climate performance**, using the potential of agriculture to enhance natural capital including carbon storage and sinks.

In order to respond to these overarching challenges to improve the productivity of agricultural systems on one hand, and to contribute to achieve the objectives of the European Green Deal on the other hand, the agricultural production in Europe has to become **more sustainable**, while still being **efficient and profitable for farmers**. Farmers’ incomes are under pressure due to rising costs of farming (fertilisers, energy, etc.), while revenues of farming lag behind due to the increasingly weak competition of European products in the global market<sup>11</sup>. Furthermore, operational risks of farming have increased during the last decade because of climate change effects which are visible through more extreme weather events, such as severe precipitation, droughts, invasion of new pests and diseases, among others<sup>12</sup>.

Achieving gains in resource efficiency, e.g. in the attentive use and management of fertilisers and pesticides, appears to be one key approach for linking both ambitions: strengthening environmental and climate performance and at the same time making the sector<sup>13</sup> more competitive. Overall, the share of management tasks as well as the relevance of data in farming have increased over recent years. In other words, agricultural production has become more data-driven, involving for instance decision making based on environmental/sensor data, production and other types of public- and private data (i.e., data from Agricultural Long Term Experiments).

Furthermore, for policy-making and implementation purposes, there is a need for improved capacities for assessing the use and the conditions of land, especially for monitoring and evaluating agricultural, environmental, and climate policy actions. In addition, EU policies, including the Common Agricultural Policy (CAP), are becoming **more performance-oriented**, requiring monitoring and evidence on implemented operations and the impact

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<sup>9</sup> These GHG emissions undermine the sustainability of farming systems (Chang et al 2021 Nature Comm) also in relation to feed and plant protein sovereignty (Cusworth et al, 2021 Global Environ Change; Röss, E. et al., 2017 Reg Environ Change).

<sup>10</sup> Biodiversity and soil quality are declining in agricultural fields across Europe, while marginal land, where biodiversity generated by agriculture may be more abundant, is often abandoned, because agricultural production is not profitable. About 1000 farms in the EU give up their business each day, especially small farms, and small farms tend to hold greater crop diversity and higher levels of non-crop biodiversity at the field and landscape scales.

<sup>11</sup> Bonjek & Ferto, 2015, J Common Mark S

<sup>12</sup> Grillakis, 2019, Sci Total Environ

<sup>13</sup> Not always, this potential of aiming for resource efficiency is fully acknowledged and the world-wide competition on prices of agricultural commodities results in continuous pressure to produce as efficiently and cheaply as possible. Often this results in short term maximisation of production at the expense of sustainable production methods.

achieved. The generation of tailored data, services and information, in combination with technological innovation, can help to address these needs.

At the same time digital technologies can increase farms’ sustainability performance and competitiveness, e.g., through precision farming, quantifying on-farm emissions and sequestration through ground sensors and remote imaging, or habitat mapping. However, the effectiveness of digital technologies and thus the potential to increase the sustainability performance of all types of agriculture (including e.g. conventional as well as organic production), strongly depends on the input data and its translation into contextualised information, evidence and knowledge informed monitoring and subsequent decision-making. Moreover, the effectiveness of digital technologies also depends on **access to input data** and to derived applications, and on their **quality, robustness, consistency and continuity** over time.

Therefore, **data** in agriculture can provide an essential contribution to the “twin” green and digital transition (see Box 1 for scope of data).

Technological innovation based on new or improved data, as well as a better coverage of digital and data technologies and services in Europe may strengthen the development of a sustainable (environmentally, economically, socially) agriculture sector. To achieve the development of both a sustainable agricultural production and efficient policy monitoring and evaluation, **data of high quality and tailored data-based solutions are essential.**

An essential component of the relevant data within the AgData partnership is Earth observation (EO)<sup>14</sup>. EO data forms one key input to precision farming and to analyses supporting the development of the agriculture sector in general<sup>15,16</sup>. EO also offers great potential to enhance (land-related) policy implementation in Europe, including the reduction of administrative burdens<sup>17</sup> on the farmers and administration as well as to strengthen policy-making and monitoring capacities<sup>18</sup>. Copernicus, the EO and monitoring part of the EU Space programme<sup>19</sup>, is one important reference in this context. Copernicus helps for instance to monitor and implement the Common Agricultural Policy (CAP) as it provides important land monitoring parameters<sup>20</sup>.

*Box 1*

*The **scope of “data”** in this partnership refers to all kinds of data that are relevant to achieve the objectives of the Partnership Agriculture of Data.*

*This includes geospatial observations (e.g. environmental data and Earth observation) and agricultural data (public and private data including e.g., farm data, IACS data held by paying agencies, socio-economic as well as modelled data).*

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<sup>14</sup> EO4Agri provide complex Analysis of needs of different groups of users and recommendations and user-oriented outputs for EO in Agriculture. See all outputs here <http://eo4agri.eu/deliverables>

<sup>15</sup> Earth observation data can also form a key input to for instance better risk assessment for agricultural production, including for insurance purposes, the management of resilient supply chains and to developing strategies to allow the sector to adapt to and mitigate climate change.

<sup>16</sup> Within the Common Policies, the CAP one of the main users of Earth observation data

<sup>17</sup> <https://op.europa.eu/webpub/eca/special-reports/new-tech-in-agri-monitoring-4-2020/en/>

<sup>18</sup> For instance, with the application of data technologies to EO and EU-wide reference data, e.g. national reporting obligations on performance indicators might be reduced, as monitoring data could be generated through the application of AI to EO data sets

<sup>19</sup> Copernicus has a global coverage, with some products specifically covering Europe. Its governance structures include Associated Countries

<sup>20</sup> Copernicus products, include for instance land cover and crop type maps, land take, crop conditions, soil moisture, water indicators and landscape fragmentation. Copernicus data also contributes to the assessment GHG emissions and seasonal climate predictions for the forthcoming months. Further potential use of Copernicus data lies e.g. with yield forecasts, water management, anticipation of plant protection and both drought monitoring and forecasting, as well as subsidy controls.

Additionally, **EO data together with agricultural production/farm data form a comprehensive data pool for monitoring and management purposes.**

Through the increasing use of digital technologies in agriculture, a huge amount of agricultural data is generated, e.g. through on-board sensors and field robotics. These data itself provide an outstanding value for agricultural decision support systems (DSS) and research<sup>21</sup> (EIP-AGRI<sup>22</sup>). In addition, they serve as indispensable reference for the development and improvement of Earth observation products and capitalisation of EO-data for data-based solutions in agriculture. However, **accessibility and use** of EU-wide reference data is still hampered by a lack of consistent legislation and appropriate business models.

Gains achieved through data generation and use, can contribute to achieving several sustainability ambitions including those manifested in the European Commission’s priorities of the **European Green Deal**, in the **Common Agricultural Policy (CAP)**, and the **Sustainable Development Goals (SDGs)** through furthering more sustainable agriculture and strengthening policy-making and implementation capacities. The tailored use of EO and other environmental data can also make a contribution to **improved environmental compliance**<sup>23</sup>.

Moreover, under the Headline Ambition of “A Europe fit for the Digital Age”<sup>24</sup>, and the **European Strategy for Data**<sup>25</sup> in particular, proposals for several enabling instruments for the better use and re-use of data for society and economy have been made. It is important to seize these opportunities and to capitalise related instruments for agricultural production and sustainability ambitions. The potential of **Artificial Intelligence (AI)** is to be exploited, including within the framework of the Coordinated Plan for AI.

Many initiatives, including several projects funded under Horizon 2020 and Horizon Europe, to boost the uptake of EO data and technologies for smart (arable) farming already exist or are starting. There are also two ERA-Nets operating in the fields of ICT in the agri-food sector<sup>26</sup> and Earth observation<sup>27</sup>. However, the **European landscape of geospatial data** sets from EO, environmental and agricultural data is currently **fragmented**, which was one of the reasons to set up the EuroGEO<sup>28</sup>, NextGEOSS<sup>29</sup> and Next-EOS<sup>30</sup> initiatives. This data landscape would benefit from upscaling existing and future initiatives in these fields. In particular for the last steps of the innovation chain, the potential of environmental observation could be further exploited for providing more tailored input data for instance in the field of agricultural production and land-related policies.

EU-wide data sets are an asset for monitoring and evaluating common policies. Also, for supporting sustainable agricultural production, the creation of data sets covering whole Europe will be a game-changer in increasing the sector’s performance in the successful implementation of **climate change adaptation and mitigation strategies**. With data from all over Europe a

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<sup>21</sup> Zhai *et al.* 2020

<sup>22</sup> <https://ec.europa.eu/eip/agriculture/en/digitising-agriculture/developing-digital-technologies/decision-support-tools>

<sup>23</sup> See e.g. COMMISSION STAFF WORKING DOCUMENT – SWD (2018) 10 final - Environmental Compliance Assurance — scope, concept and need for EU actions. Accompanying the document EU actions to improve environmental compliance and governance{COM(2018) 10 final}

<sup>24</sup> [A Europe fit for the digital age | European Commission \(europa.eu\)](#)

<sup>25</sup> [Strategy for Data | Shaping Europe’s digital future \(europa.eu\)](#)

<sup>26</sup> <https://www.ictagrifood.eu/>

<sup>27</sup> <http://www.era-planet.eu/>

<sup>28</sup> The EuroGEO regional initiative, launched in 2017 under GEO (the intergovernmental global Group on Earth Observations), acknowledges that defragmenting the European EO landscape will benefit the users. (See [https://ec.europa.eu/info/research-and-innovation/knowledge-publications-tools-and-data/knowledge-centres-and-data-portals/eurogeoss\\_en](https://ec.europa.eu/info/research-and-innovation/knowledge-publications-tools-and-data/knowledge-centres-and-data-portals/eurogeoss_en)).

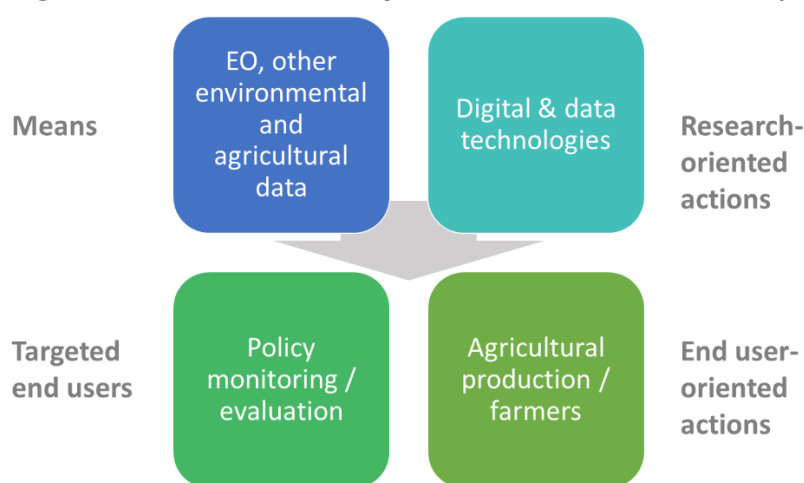
<sup>29</sup> <https://catalogue.nextgeoss.eu/>

<sup>30</sup> [https://www.earthobservations.org/documents/gwp20\\_22/NEXT-EOS.pdf](https://www.earthobservations.org/documents/gwp20_22/NEXT-EOS.pdf)

critical mass of reference for the effective application of Big data technologies can be achieved and several biogeographic zones covered. Steps to join forces in this field have been made. For instance, the Declaration on ‘A smart and sustainable digital future for European agriculture and rural areas’ (2019)<sup>31</sup>, signed currently by 26 Member States, reflects the ambition and the commitment for joint action to deal with the challenges agriculture and rural areas are facing, such as climate change, through the effective use of digital and data technologies.

Beyond the potential of **linking efforts across domains and disciplines** across Europe, there is also the opportunity to achieve synergies in addressing data needs, and in **servicing private/commercial and public interests** in data of high quality and information value and in tailored data-based solutions for agriculture and policy monitoring and evaluation<sup>32</sup>. The four domains covered by the partnership AgData can be found in Figure 1 below.

*Figure 1: Visualisation of the 4 domains covered by the partnership*



### 3.1.2 Problem definition

The need for action to increase sustainability ambitions in agriculture and other fields is broadly acknowledged, as well as the potential of digital & data technologies and Earth observation to increase the performance of the agriculture sector and to support policy monitoring and evaluation (see previous Sub-section 3.1.1). Nevertheless, this potential has not been fully exploited so far; the following challenges and bottlenecks have been identified:

- **Moderate end user uptake of digital and data technologies:** The uptake of digital & data technologies in the agriculture sector is still moderate compared to the potential offered, and thus, also the potential of data technologies, EO and early predictions is not fully exploited. The barriers to EO and early predictions data uptake include a perception of technical issues, need for data at improved temporal and spatial resolution, costs associated with ICT infrastructure, and lack of EO training and education among staff in SMEs (Small

<sup>31</sup> The signing Member States recognise the importance of addressing without delay the economic, social, climate and environmental challenges facing the EU's agri-food sector and rural areas, and highlight the necessity to encourage an evolution of farming systems towards more resilience and resource efficiency in the long term, and note the potential of digital technologies to help tackle such challenges. (<https://ec.europa.eu/digital-single-market/en/news/eu-member-states-join-forces-digitalisation-european-agriculture-and-rural-areas>)

<sup>32</sup> It can be assumed that data sets originally tailored to end-user needs in the field of agriculture and policy monitoring and evaluation, are also of value for other sectors, such as insurance, as well as common good purposes.

and Medium-sized Enterprises) and Local Regional Authorities<sup>33</sup>. Additional reasons for limited exploitation of freely available Earth observation data, which also in its raw format is seen as valuable input to precision farming, is its limited spatial resolution. This hampers the efficient use of the data in the agriculture sector. Small parcels and small farms (physical size) have limited options to use EO data products across their farm. Farms, for which the investment materialise, may use sensors to collect additional information on e.g. crop and soil status. Consequently, the demand for data sets with higher information value will remain.

Finally, there is need to transpose the data to information and knowledge, to e.g. facilitate decision-making of farmers, to increase end-user uptake, as raw data as such is frequently of little help (see also below).

- **Digital divide between farms:** The effectiveness of digital technologies strongly depends on the input data. While technically advanced farms (with sufficient investment capacities) can afford to deploy local/own sensors generating data of high resolution and of high information value, other farmers may have to rely on freely available input data, such as satellite data, decreasing their competitiveness. This is one reason of the increasing digital divide between types of farms. Other reasons include a lack of digital skills (see above).
- **Poor data availability for efficient policy monitoring and evaluation.** The development and implementation of tailored monitoring and evaluation systems is frequently challenged by potentially high administrative burdens/costs in collecting and analysing dedicated data. In addition, one frequent obstacle to effective monitoring is the lack of national baseline data comparable to later measurements and the availability of longer-term time series of monitoring data. There is a clear need to increase the ambition of “Better policies” through strengthened bases for policy formation and implementation as well as evidence-based and better-informed decision-making. Products for policy monitoring and evaluation are still limited, despite the combination of EO and data technologies promises to lower administrative burdens on the medium- and long term. For instance, time and effort spent collecting statistical data can be reduced and analysed EO data can deliver wide-area and objective information on agricultural land use (in comparison to potentially biased sampled information from on-the-spot checks). To date there is no effective way of accessing the large amounts of data that currently is being placed in databases owned by farmers, or their organisations, and therefore, possible “decision support systems” (DSS) based on Farm Management Information System (FMIS) data are not currently being exploited by policy monitors.
- **Lack of reference data sets to capitalise Earth and environmental observation data through the use of data technologies:** The potential for the use of big data analytics in the field of Earth and environmental observation is high, offering the possibility to analyse patterns leading to a critical mass, higher efficiency and a sufficient amount of information to base decisions on. In order to generate ‘big data’ sets capable of delivering added value to EO, reliable reference data (e.g. *in-situ*, land use) is required from across Europe representing different biogeographic, climatic and production conditions. Currently, the availability of freely available or affordable reference data (standardised and in a common format) related to agriculture is limited, and/or exists across disparate agencies (e.g. Meteorological agencies, Agri-research institutes, environmental agencies, flux databases). Furthermore, possibilities to generate big data sets offered by privately held farm data are

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33 THE CORDINET PROJECT: ANALYSIS OF THE BARRIERS LIMITING A MORE DIFFUSE AND SYSTEMATIC USE OF EARTH OBSERVATION COPERNICUS-BASED SOLUTIONS, Teodosio Lacava1 , Lucio Bernardini Papalia2 , Iole Paradiso2 , Monica Proto1 , Nicola Pergola1 (Link here: [IEEE Xplore Full-Text PDF:](#))

currently primarily used by companies in the machinery and agro-chemical sectors (see below).

- **Difficulties for farmers to take control of their data.** Increasing amounts of data is generated by the farmer through the use of all kinds of Internet of Things (IoT) sensors and precision farming activities. These data are very valuable for optimising farming operations, monitoring, evaluation and registration of farming activities. The data could also serve as reference data to capitalise EO data. However, many of the services applied by the farmer result in data-streams which are beyond control of the individual farmer. With increased use of these services, the data-landscape of the farmer is becoming more and more fragmented, hidden in internet-clouds of solution providers. Data platforms of service providers often want to dominate market positions and strive to bind the farmer exclusively to their services (vendor lock-in). This puts farmers into relatively weaker positions where they may be reluctant and/or unable to share data for innovation and other business models. This blocks innovation and opportunities for improving the sector’s performance, e.g. through benchmarking. Furthermore, the EU Code of Conduct on the use of farmers’ data does not cover data sharing between farmers, e.g. for tailored benchmarking and advice purposes<sup>34, 35</sup>.
- **Scarcity in adoption of big data solutions for agricultural applications:** For multiple use cases, EO data needs to be processed and/or integrated with other sources (e.g. Farm Management and Information Systems or other data exchange platforms) of data to tailor it to the needs of the end users. Currently, there are still very few systems that are able to utilise EO data in relation to data generated on the farm or field, due to, among others, technical challenges in the provision of related data-based solutions and other obstacles, such as high production costs to the provision of related data-based solutions.
- **Insufficient data interoperability:** Data interoperability is critical to enable the sound integration of data and the application of data technologies e.g. across a range of geographical scales (e.g. field, farm, region, country) and time/temporal scales (e.g. minute, hour, day, month, year). However, many of the existing data sets are not immediately exchangeable because they use different (and often proprietary) formats, standards, disciplines, actors or timelines. This has led to a number of crucial incompatibility and interoperability problems over the years. This problem does not only exist between sectors/domains, e.g. agriculture and environmental observation, but also within domains.
- **Missing State-of-the-art cybersecurity protection mechanisms and Privacy enforcement technologies:** As part of the industrial strategy, special attention should be paid to the increased data protection needs and cyber security due to the application of new technologies. State-of-the-art cybersecurity protection mechanisms need to be applied. Light-weight encryption and protocol schemes to support confidentiality, integrity protection and authentication are required. Privacy enforcement technologies such as anonymisation and homomorphic encryption will increasingly be required to support seamless data-sharing across parties of a data ecosystem.
- **Administrative burden:** The need for simplification to reduction of the efforts in reporting obligations are additional challenges countries and stakeholders are confronted with.

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<sup>34</sup> <https://eudatasharing.eu/examples/copa-cogeca-eu-code-conduct-agricultural-data-sharing-contractual-agreement>

<sup>35</sup> Obtaining certain data from farmers requires their agreement to share their own data. Digital farmer consent systems (e.g. API management) are not commonly used to facilitate these steps making data sharing safe and efficient, with respect for farmer.

- **Changing regulatory environment:** EU Member States and stakeholders will be challenged in the coming years by a changing regulatory environment in the field of digital and data technologies. Forthcoming legislation will include a Data Act, a Data Governance Act, a Digital Markets Act, a Regulation for AI, an Implementing Act on High Value Sets. These legal acts will affect both – data sharing in the agricultural domain and data use in R&I. Both, Member States and stakeholders will have to develop the capabilities to work with the new instruments and fully use their potential. The Partnership Agriculture of Data will highlight how data can be effectively and efficiently capitalised under the new regulatory regimes in synergy with other EU initiatives.

## 3.2 Common vision, objectives and expected impacts

### 3.2.1 Scope

Sustainable agricultural production and policy monitoring needs can be supported through the provision of tailored data and data-based solutions, especially through EO in combination with other data and digital & data technologies. At the same time, the agriculture sector at farm level produces data during digitalised farming practises, as also does the public administration. This data can be capitalised to strengthen capacities of the agriculture sector in the public and private domains. Integrating different sources of data would lead to even more relevant information in this context and provide scope for the development, delivery and uptake of products and services in agricultural production and monitoring.

### 3.2.2 Vision and objectives

This sub-section sets out a vision as well as the general, specific and operational objectives to frame the scope and actions of the partnership.

#### 3.2.2.1 *Common vision*

The partnership envisions a sustainable agriculture – environmentally, climate-wise and socio-economically – as well as a strengthened policy monitoring capacities. These will both be the result from the use of innovative big data technologies in the agricultural area.<sup>36</sup>

Following a co-design approach, the partnership will foster the development of common approaches and systems as well as sustainable structures to capitalise Earth and environmental observation and other data sets for both the private and public domain.

There will be two main target groups for this partnership the 1) all types of farmers/agricultural producers, and 2) policy-makers and the public administrations. Moreover, it is expected that other stakeholders in or linked to the agricultural ecosystem will benefit from the results of the partnership.

#### 3.2.2.2 *Objectives*

The general objective of this partnership is twofold:

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<sup>36</sup> For the capitalisation of Earth observation data through data technologies also other data sets and methods will be essential. For instance, forecasting data, which might be generated within the work of the partnership or drawn from other sources, is likely to play a key role to develop data-based solutions for the sector and policies.



1. Enhancing climate, environmental and socio-economical sustainability and productivity of agriculture, through exploiting the potential offered by EO, other environmental and agricultural data, and using newly developed digital & data technologies.
2. Increase capacity for policy monitoring and evaluation in Europe using EO, other environmental and agricultural data and newly developed digital & data technologies.

**Specific objectives** of this partnership are:

1. Improve agri-environmental monitoring tools and strengthen capacities (particularly for small farms and SMEs) to assess the status of agri-environmental and climatic conditions particularly by enhancing the integration of data sets provided by various platforms/networks.
2. Boost the uptake of digital & data technologies in agriculture, by providing tailored, easily accessible end-user-oriented data-based solutions building on EO and other environmental data.
3. Promote the use of EO, environmental and other data as well as digital & data technologies to improve climate adaptation and resilience of agriculture and to minimise undesired impact of agriculture on the climate, environment and biodiversity.
4. Achieve synergies in the development and utilisation of data-based solutions for both the agriculture sector and policy monitoring/evaluation.
5. Facilitate the use and reuse of EO, environmental and other data to create tools and services that can be easily adopted by farmers, organisations and businesses and to achieve a wide and rapid outreach of the benefits of their use encouraging their wider uptake beyond the agricultural domain<sup>37</sup>.

**Operational objectives** of this partnership are:

- a) Facilitate use, reuse and sharing of farmers, agro-industries and public institutions data with EO and other environmental and agricultural data including from existing data repositories, both public and private (where possible).
- b) Develop, implement and maintain common approaches towards monitoring and evaluation.
- c) Develop novel approaches or further build on the current ones, for the use of data technologies in the field of Earth observation and explore opportunities to transfer innovative data technological methods from other domains to the work of the partnership.
- d) Develop data-based solutions to support the agriculture sector to take decisions to adapt production to climate change in an environmentally and socio-economically sustainable way.
- e) Work towards the further development and/or creation of institutional structures and data infrastructure needed to provide data-based solutions for the agriculture sector and policy-making<sup>38</sup>.

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<sup>37</sup> While the key focus of the partnership lies with the development of data-based solutions for the agricultural sector and policy monitoring, it will be important to capitalize results through encouraging their wider (re)use beyond agriculture, e.g. other sectors or domains may benefit from the developed databased solutions as well.

<sup>38</sup> This would contribute to successfully meeting the challenge of adaptation and mitigation to climate change with the enhancement of the uptake of R&I activities on digital Earth, environmental observation and forecasting data

- f) Enhance the use of data and exploiting and generating new data sources, data sets, and flows in the public and private domains, and enable fast adoption of innovative data-based solutions tailored to end-user needs by bringing together multiple actors<sup>39</sup>.
- g) Ensure coordination and alignment of EU/National/Regional programmes and a continuum in actions from Research & Innovation to implementation.

### 3.2.3 Expected Impacts

The partnership AgData will support sustainable<sup>40</sup> and competitive agricultural production, the digital transition, especially in the field of digital farming and the strengthening of policy monitoring and evaluation capacities.

Specifically, the partnership will target the following **expected impacts** under three complementary impact categories: 1. Scientific, 2. Societal (incl. environmental) and 3. Economic & technological<sup>41</sup>.

#### **Scientific**

- a) Increased synergies between and better integration of different actors (e.g. scientists, technicians, policy-makers, practitioners, businesses, farmers, end users) achieved in the digital Earth, environmental observation and agricultural communities within Europe, transforming both the R&I and economic ecosystem to deliver more and better data-based solutions to the end users.

#### **Societal (incl. environmental)**

- b) Increased environmental, climate and socio-economical sustainability performance of the agriculture sector.
- c) Enhanced contribution from the agriculture sector to the important need for protecting the environment, halting and, if possible, reversing biodiversity loss in Europe and globally, as well as to the reduction of the emission of greenhouse gasses from agriculture.
- d) Enabling the sector and strengthen its capacity to adapt to climate change and to meet the objectives set by sustainability-related policies, considering e.g. risk analyses/indicators, such as environmental, technical, economic or social risks.

#### **Economic & Technological**

- e) Contribution to creating an institutional structure that includes a data infrastructure needed to provide data-based solutions for both policy-making and the agriculture sector (including to strengthening the sector’s economic performance).
- f) Strengthened capacities to evaluate the effectiveness of policies (with reference to agriculture, environmental- and market-related policies and the combined potential effects of them).

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and services at European and national scales by relevant stakeholders, including businesses and farmers, to make Europe a global leader in sustainable agriculture.

<sup>39</sup> Multiple actors, including in: environmental observations and other data, including data technologies, with farmers, agronomists, policy-makers and public administration, including paying agencies and companies developing farm machinery and software (e.g. Farm Management Information Systems).

<sup>40</sup> All three dimension of sustainability are targeted: environmental, social and economic sustainability.

<sup>41</sup> Three impact categories align with those set out in [Annex V of the Horizon Europe Regulation](#)

### 3.2.4 Intervention logic

Based on the vision, objectives and expected impacts outlined above, a draft of an intervention logic figure (Figure 2) has been developed (see next page).

Figure 2: Intervention logic



### 3.2.5 The way towards a Strategic Research and Innovation Agenda (SRIA) and expected transformation of R&I

Future European Partnerships under Horizon Europe must develop a Strategic Research and Innovation Agenda (SRIA) before their launch in order to ensure key strategic R&I domains, covering the main gaps to achieve the partnership objectives are focused upon during the partnership execution; also, to ensure that the long-term R&I vision is translated into a concrete strategy with reasonable and measurable targets. The SRIA does not follow a specific template but is fully tailored for and adapted to the needs of the partnership.

The SRIA is part of the final partnership document/application, and the partnership proposal should therefore include the scope and main corner stones of the SRIA and in particular a roadmap that outlines the multi-source material used as basis of the SRIA, the envisaged elaboration process of the SRIA, as well as its estimated timeline. Herewith the suggested roadmap for the development of the SRIA under the European Partnership Agriculture of Data is presented in Figure 3.

The main aspect to be considered for the SRIA development, is the identification and elaboration of R&I priority areas for coordinated action aligned with the intervention logic of the partnership and measurable KPIs for all objectives (e.g. general, specific and operational) and expected impacts. In addition, topics to be included in the main Horizon Europe Work Programme have to be developed on the basis of the (draft) SRIA.

Following a co-creation process, Member States’/Associated Countries’ and stakeholders’ needs, flagged relevant initiatives and the assessment thereof, were gathered among others through webinars and surveys carried out on basis of the general outline of the partnership (ANNEX IV and Figure 3 on the next page). These were taken into account and complemented with further stocktaking of relevant R&I activities and their results (see also ANNEX II), including those available from the tight collaboration with the existing ERA-Nets (ERA-PLANET and ICT-AGRI-FOOD) and initiatives such as INSPIRE, DestinationEarth, GEO/GEOGLAM.

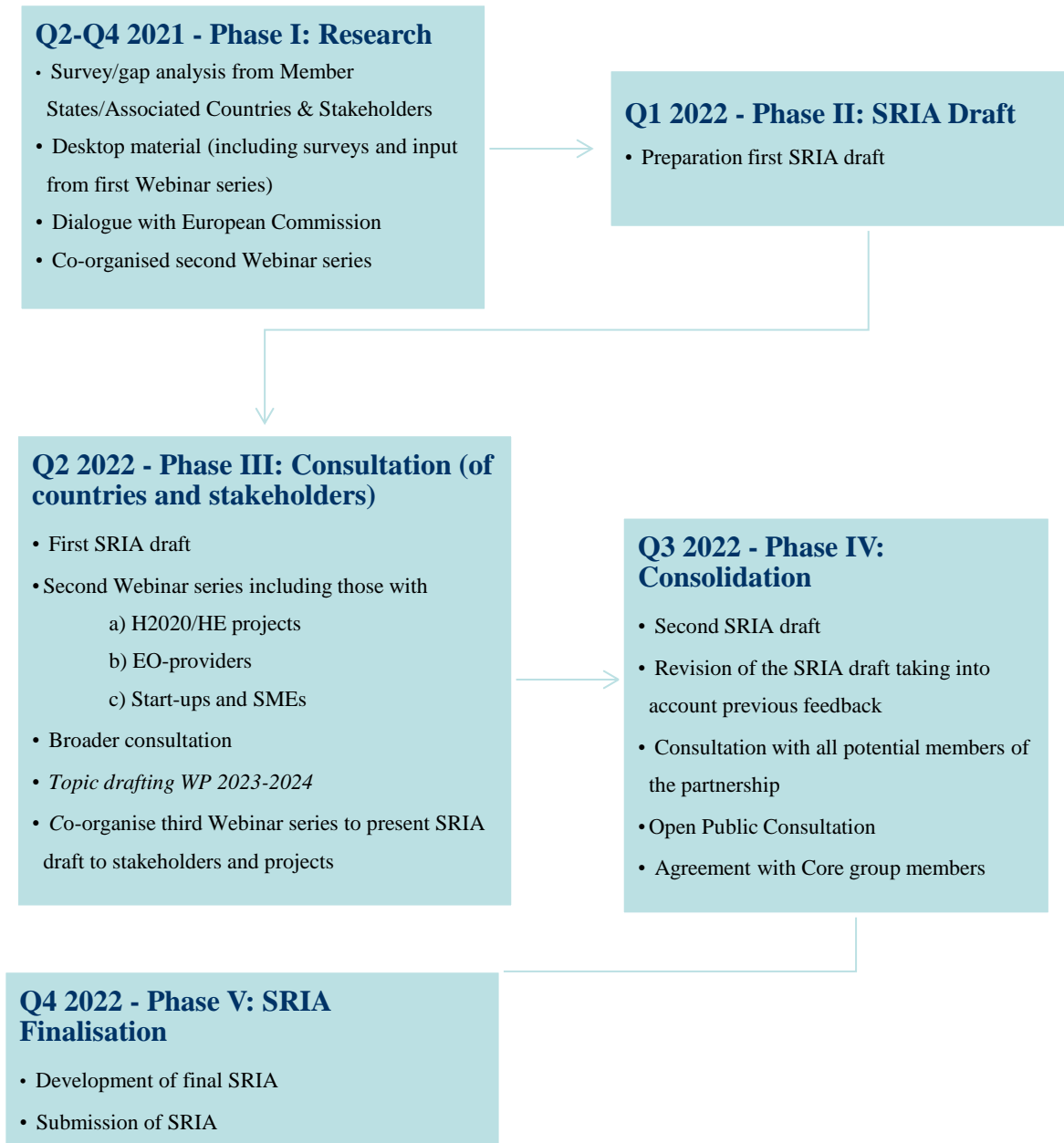
These actions concentrated on activities in the four domains relevant to this partnership:

- 1) Agricultural production/farmers
- 2) Policy monitoring/evaluation
- 3) EO, other environmental and agricultural data
- 4) Digital and data technologies

Further development of the SRIA will include an extensive gap-analysis on the basis of the aforementioned documentation. Preliminary interim results point to the need of research to – transpose data into actions – as well as to the generation of more independent data sets and analyses. Opportunities were seen for instance in the better use of farming data, developing input to decision support/farm management systems, and generally of exploiting new data sources and -flows in the public and private domains. Many specific questions related to sustainable agriculture and policy monitoring and evaluation were identified, for instance to support variable rate applications and the reduction of administrative burdens. Other aspects mentioned were to foster innovation to facilitate the better uptake and use of Earth observation data for instance in the field of evidence-based policy-making, the added value to combining data sets with R&I actions and the trustworthy exploitation of agricultural data. Other key aspects to be considered for the

development of this partnership are the determination of the TRLs (a high level of innovation is expected) and the sound elaboration of the FAIR principles and Data Management Plan (DMP). A preliminary, non-exhaustive list of key R&I fields of action and perspectives to be addressed in the SRIA development process is compiled in Annex III. The envisaged process of the SRIA development will be an iterative process that will be divided in five main phases: (i) exploring R&I needs, (ii) SRIA draft, (iii) consultation, (iv) consolidation and (vi) SRIA finalisation (see Figure 3 below).

**Figure 3: Phases of the envisaged SRIA development**



### *Monitoring framework using “SMART” Key Performance Indicators to measure the progress towards the objectives*

The first version of the SRIA will contain an agreed and supported monitoring framework to ensure that the partnership reaches its planned objectives. The monitoring framework will comprise a set of common, “SMART” (specific, measurable, attainable, relevant and time-bound), and user-friendly KPIs embedded in a clear and comprehensible monitoring and evaluation scheme. The KPIs will allow the partnership to measure the achievements of the partnership's activities with respect to the specific objectives (chapter 3.2.2.2) and form the basis of the monitoring and evaluation of impacts, achievements and effectiveness of the partnership's activities. In further versions of the SRIA some KPIs are likely to be added to the set of KPIs of the monitoring framework.

The monitoring and evaluation scheme will provide the basis to collect the underlying data suitable to rate the impacts of the partnership itself and its activities, particularly the funded R&I projects of the partnership's internal and external calls/funding activities. The scheme comprises different relevant features (results) including inputs, outputs, outcomes and impacts. The KPIs will be organised according to the addressed objectives and comprise in their definition the related indicator type (e.g. input indicator, output indicator, outcome indicator, impact indicator), their respective key question, success criteria for the evaluation (target) and the source of data (e.g. report or questionnaire).

Measuring long-term impacts is very desirable but often hard to realise, as projects (including this partnership) expire. In the context of the “Exit Strategy” (chapter 3.3) it will be explored how this data set can be collected and considered even after the official lifetime of the partnership. In Section 4.5.2.5 the principles for the organisation of KPIs and draft examples for KPIs (to be refined and agreed for first version of SRIA) are provided.

### 3.2.6 Possible links to other Horizon Europe partnerships and Missions

The AgData partnership will assure the connection to other relevant European Partnerships, particularly co-funded candidate partnerships under Cluster 6: the three forthcoming partnerships on Food systems, Agro-ecology and Living labs (AELL), and Animal Health and Welfare, as well as the partnerships on Water4All and Safeguarding Biodiversity. Those are the partnerships that are likely to contribute to the identification of data-needs in the agriculture sector and may also serve as test-bed for data solutions developed within this partnership.

In the further elaboration of the SRIA, also forthcoming initiatives under Horizon Europe and other EU level programmes will be taken into consideration to achieve best synergies, in particular those in Horizon Europe Pillar 2, Cluster 6 ([Food, Bioeconomy, Natural Resources, Agriculture and Environment](#)), 5 ([Climate, Energy and Mobility](#)) and 4 ([Digital, Industry and Space](#)). The partnership will be able to build upon results of technologies developed under Cluster 4 in the field of data- and space technologies. This will include the connection to other relevant European Partnerships (see Sub-section 4.1.2).

In addition to that, the possibility to connect with partnerships from other clusters will be assessed, in particular the potential for synergies with the European Partnership on Artificial Intelligence, Data and Robotics (Cluster 4), which will develop novel solutions in the use of data technologies of cross-sectoral relevance and can therefore be picked-up by AgData.

Next to the other Horizon Europe partnerships, linkages to the Horizon Europe Missions are relevant, in particular when it comes to the Missions of Soil health and Climate adaption. These missions are partly covering the same domains as AgData, have a strong societal outreach, and may therefore serve as multiplier of the partnership results. In addition, like some partnerships, they may also provide information about data-needs and test data-based solutions (e.g., in living labs). When opportunities for collaboration are identified, the governing board can establish the best way of setting up joint actions to benefit from them.

### 3.2.7 Investments/Resources

*This part is covered under Section 4.2*

### 3.2.8 Exit Strategy

*This part is covered under Section 4.3*

## 3.3 Necessity for a European Partnership

### 3.3.1 Addressing European and global challenges

**Improving the sustainability performance and competitiveness of agricultural production, is a key challenge of the sector and policies in Europe** (see Sub-section 3.3.2). The use of digital technologies in a data-driven agricultural production, is one crucial factor to address this ambition, particularly because of the potential for increased resource efficiency (see Section 3.1)<sup>42</sup>. The effectiveness of digital technologies strongly depends on available data, more specifically on data coverage quantity and quality, and coupled with targeted control- and decision support systems. This partnership aims at generating data-based solutions to strengthen the capacities of the agriculture sector to increase its performance and to protect and restore the sector’s rich natural, cultural and productive resources.

**Achieving the “twin green and digital transitions” in a sustainable way and avoiding digital divides, is a challenge several sectors, including agriculture, are facing.** In the digitalisation of the economy, there are frontrunners and late-adopters, and consequently a risk that businesses, which do not adopt new technologies, will not be competitive any longer. Also in agriculture, there is the risk of a digital divide between farms, especially due to differences in capacities as it regards investment opportunities, achieving scale-effects and cost-effectiveness in investments in digital tools, and digital skills. In particular, economically stronger and physically larger farms can afford to invest in technically advanced devices, such as sensors to collect data of higher resolution and greater information value than freely available data.

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<sup>42</sup> Note, that this partnership is not intended to support all elements needed to boost the digitalisation of the agriculture sector, rather it concentrated on the generation of data as input for digital technologies. As it will be explained in Sub-section 4.1.2, synergies with the implementation of Member States’ digitalisation strategies under the CAP are envisaged.



This partnership will generate data-based solutions, which enhance and/or supplement open data, such as satellite data, in combination with all types of reference data, which may include sensitive, business and private data, through the application of data technologies, and will make it available to all farmers.

**Capitalising data in a fair manner and closing market gaps is a global challenge concerning several domains.** In agriculture, “Big data-based solutions” to inform agricultural production, are frequently provided by the machinery or agro-chemical sectors. They collect a large quantity of data through their customer base, which is equipped with digital technologies. Despite generating input data needed for those “Big data applications”, farmers frequently do not directly benefit from the value generated. Moreover, the market primarily offers advanced data-based solutions to farmers with capacities to invest in sensor technologies. This partnership will close market gaps, generating data-based solutions for all types of farms. Agricultural production data and other reference data will be capitalised and the value created shared in a proper manner. For instance, technically advanced farmers may provide input data which can – through the application of data technologies, also be made relevant for technically less advanced farms as part of optimisation and benchmarking between farms. At the same time, the more advanced farms could quickly adopt new technologies which then could act as both an improvement in terms of sustainability for technologically advanced farms and an improvement in terms of economical sustainability for not as advanced farms. Generally, generating fairly shared value from data will incentivise data production and use.

**Adapting agricultural production patterns to climate change is a task ahead of farms across Europe and globally.** This partnership will use data from various biogeographic regions across Europe, including EO, other environmental and agricultural data, and apply data technologies to generate information and knowledge as basis for the development of climate adaptation strategies for the agriculture sector. At the same time technologies can act as systems to reduce the climate and environmental impact of agricultural production.

**Tailoring policy measures, and assessing and demonstrating policy performance is essential to effectively spend public money and rectify its use.** This partnership will generate data, innovative data-based solutions, information and knowledge to strengthening policy monitoring, evaluation and implementation capacities as well as informed decision-making especially in the fields of agricultural, climate and environmental policies.

### 3.3.2 Contribution to policy priorities

The partnership fosters as one central element the support to the “twin green and digital transitions” through excellence in R&I and the generation of data-based solutions and knowledge. The second key element is to strengthen policy capacities, including a contribution to the formation of policy priorities based on identified gaps<sup>43</sup>.

The partnership will contribute to a number of the European Commission’s priorities, in particular to the *European Green Deal, A Europe for the Digital Age, An economy that works for people,*

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<sup>43</sup> Melf-Hinrich Ehlers, Robert Huber, Nadja El-Benni, Alexander Gocht, Claus Aage Grøn Sørensen, Markus Gussett, Catherine Pfeifer, Krijn Poppe, Áine Regan, David Christian Rose, Sjaak Wolfert, Robert Finger 2022. Scenarios for agricultural policy in the era of digitalization. *Agricultural Systems*, Volume 196, February 2022

and *A new push for European democracy*, as it will be explained below in greater detail. It will contribute to the objectives of the Common Agricultural Policy post 2023 and the EU’s Space policies as well as to the Sustainable Development Goals in particular the field of agricultural production, environment and climate.

The partnership intends to strengthen the position of innovative start-ups and SMEs operating in the fields of agriculture, agricultural technology, Earth observation, and digital & data technologies as well as providers of data services.

It will also increase the capabilities of Member States and stakeholders to effectively and efficiently implement forthcoming regulatory frameworks in the field of data and digital technologies, and contribute to address the common challenge of simplification.

Finally, the partnership will contribute to all of the four strategic orientations of the first Horizon Europe Work Programme (Table 3.1).

**Table 3.1: Contribution of the Partnership Agriculture of Data to the Horizon Europe Strategic Orientations**

Strategic Orientations	Contribution of the Partnership Agriculture of Data to achieve objectives
Promoting an open strategic autonomy by leading the <b>development of key digital, enabling and emerging technologies, sectors and value chains to accelerate and steer the digital and green transitions</b> through human-centred technologies and innovations	Support to the twin green and digital transitions in agriculture through exploiting the potential of digital & data technologies for agricultural production and policy evaluation
Restoring Europe’s ecosystems and biodiversity, and managing sustainably natural resources to ensure food security and a clean and healthy environment	Support to sustainable agricultural production and resource management Support to food security to strengthening the sector’s competitiveness and resilience Support to a clean and healthy environment through enabling the use of digital & data technologies in agriculture, for precision farming in particular
Making Europe the first digitally enabled circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems	Support to the twin green and digital transitions (including climate mitigation) in agriculture through exploiting the potential of data technologies
Creating a more resilient, inclusive and democratic European society, prepared and responsive to threats and disasters, addressing inequalities and providing high-quality health care, and empowering all citizens to act in the green and digital transitions	Support to the sector’s capacities to adapt to climate change, including through risk management Reducing digital divides between farms through the provision of data-based solutions as input for digital technologies in agriculture

### 3.3.2.1 Unions strategic priorities and policies

The AgData partnership will make a significant contribution to achieving the Union’s strategic priorities and objectives of common policies. In this sub-section, it is outlined how the partnership will contribute to specific policy ambitions. It is also explained, how the partnership will contribute to approach challenges a number or all Member States and stakeholders are jointly facing. Envisaged synergies with other EU policies and programmes are elaborated in Sub-section 4.1.2.

From the six strategic priorities for the period 2019 – 2024, the partnership will contribute in particular to the headline ambitions of a “European Green Deal” and “A Europe fit for the Digital Age”. The partnership will support the twin digital and green transitions of the agriculture sector through the generation and provision of data-based solutions. At the same time, it fosters the (re-) use and capitalisation of data for the economy and society by fostering innovation, which is a key ambition of the European Strategy for Data. The partnership is inherent part of the coordinated plan for AI.

**Table 3.2: Contribution to the Unions Strategic Priorities 2019 - 2024 by the Partnership Agriculture of Data**

<b>Strategic Priority 2019 - 2024</b>	<b>Strategy/Action Plan</b>	<b>Contribution of the partnership</b>
<b>A Europe fit for the digital age</b>	<b>A European Strategy for Data</b>	Fostering the reuse and capitalisation of data in the public and private interest  Strengthening businesses capacities to more effectively use digital technologies through the provision of data-based solutions  Contributing to empower people, businesses and organisations to make better decisions based on insights from non-personal data
	<b>Digital Compass – Pathway towards 2030</b>	Contribute to increasing businesses capacities to use AI- and Cloud based solutions
	<b>Coordinate Plan for AI</b>	The partnership is inherent part of the Coordinated plan for AI and will contribute to its objectives.
	<b>EU Space Policy</b>	Stimulating start-ups which develop innovative solutions based on EU space technologies, space data and services
<b>A European Green Deal</b>	<b>Farm-to-Fork-Strategy</b>	Supporting the transition to a fair, healthy and environmentally-friendly food system  Supporting emission reduction efforts  Supporting the development of monitoring data to track progress towards targets
	<b>Biodiversity Strategy</b>	Furthering capacities for sustainable agricultural practices, such as precision agriculture  Strengthening capacities to spatially target policy measures in agriculture  Strengthening capacities to monitor the development of agro-ecosystems

	<b>Zero pollution Action Plan</b>	Supporting emission reduction efforts Supporting the development of relevant monitoring data
	<b>2030 Climate Target Plan/ European Climate Pact/Adaption strategy</b>	Contribute to the development of assessment approaches to track progress towards climate targets, this may include for instance support to carbon farming tracking Generating data on climate-related risks and losses
	<b>8<sup>th</sup> Environmental Action Programme</b>	Strengthening capacity of the sector to adapt to climate change, including increased resilience
<b>An economy that works for people</b>	<b>SME Strategy</b>	Strengthening innovative SME’s opportunities to tap into large repositories of data Enabling SMEs to further capitalise data sets generated through the partnership through data technologies Encouraging SMEs, farmers in particular, to use data-based solutions
	<b>Industrial strategy</b>	Supporting the twin transition to a green and digital economy Approaching public and private interests in a synergetic way through capitalising public and business data
<b>A new push for European democracy</b>	<b>Better policy making</b>	Contributing to better policy-making and more informed decision-making by policy-makers, businesses and society at large through the provision of data, information and knowledge
	<b>Simplification</b>	Reducing administrative burdens, e.g. reporting obligations, through the development of AI generated indicator data for policy monitoring and evaluation
<b>Promoting our European way of life</b>	<b>Declaration of Digital Rights and principles</b>	Promoting European values in the handling of data

The partnership fosters objectives stipulated in the Digital Compass – a Pathway towards 2030, in particular by increasing businesses capacities to use AI- and Cloud based capacities. As described in Table 3.2, above, the partnership will contribute to achieve the objectives of the Farm-to-Fork Strategy, the Biodiversity Strategy, the Zero Pollution Action Plan, the European Climate Pact/Adaption strategy and the 8<sup>th</sup> Environmental Action Plan. A key factor to do so will be the partnership’s contribution to reduce emissions and strengthening capacities for climate adaptation.

The headline ambition “An economy that works for people” is inherently linked to the partnership’s ambition to address public and private interests in a synergetic way by capitalising public and business data.

With strengthening policy monitoring and evaluation capacities, the partnership will contribute to better policy-making and more informed decision-making by policy-makers, businesses and society at large. The partnership will thus contribute to the headline ambition of “A new push for European democracy”.

Finally, the partnership will promote European values in the handling of data and contribute to the headline ambition of “Promoting a European way of life”. It may serve as a prototype of a novel approach towards the capitalisation of data.

### Common Agricultural Policy (CAP)

The partnership will contribute to achieving the objectives of the future Common Agricultural Policy (CAP) post 2023 related to increasing the sustainability and competitiveness of the agriculture sector. In particular, it will contribute to building capacities for achieving the so-called cross-cutting objective of *Modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake*. Member States are elaborating digitalisation strategies and thus elaborating a strategic approach how the uptake and the effective deployment of digital technologies in agriculture and rural areas will be fostered. The partnership will play a decisive role in increasing the effectiveness of digital technologies deployed by farmers through the provision of data-based solutions and the benefits of implementation. Similarly, the partnership can support the implementation of the Farm Sustainability Tool for Nutrient Management (FaST) by generating additional data layers, as well as enhancing the implementation of measures focussing on precision farming, e.g. in the context of the eco-schemes<sup>44</sup>.

On medium-term, the partnership has the potential to contribute to the ambition of simplification by generating monitoring and evaluation data without inducing additional reporting obligations.

Envisaged synergies with CAP measures are outlined in Sub-section 4.1.2.

### EU Space Policy

The partnership will benefit from data, information and services delivered under the EU Space Programme, in particular from Copernicus, the part on Earth observation and monitoring. In return, the partnership can contribute to and support the EU Space Programmes objective to deliver accurate and reliable Earth observation data, information and services, more specifically in the domain of agriculture.

#### *3.3.2.2 Sustainable Development Goals (SDGs)*

With its approach towards supporting sustainable agricultural production while also strengthening the agriculture sector’s competitiveness, the partnership will contribute to a number of Sustainable Development Goals (SDGs), in particular to targets in the areas of Zero Hunger, Sustainable Land Management, Sustainable Economy and Climate Action<sup>45</sup>.

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<sup>44</sup> Member States have the opportunity to offer support to precision farming as one option under the so-called eco-schemes under the CAP post-2023.

<sup>45</sup> The partnership will contribute to the following SDGs targets:

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

Also: Digitisation has been identified as a goal in itself (SDG 9) and as a tool with which to achieve the other Sustainable Development Goals by 2030

### 3.3.3 The need for the use of the partnership instrument

For achieving the objectives outlined in Sub-section 3.2.2, in particular for addressing private and public interests in data-based solutions related to agriculture in a synergetic way and sustaining independent data service provision, the use of the partnership instrument is an asset. Foreseen key actions to be implemented by the partnership include a) Review and development of novel reference data sets/data-based solutions; b) Upscaling of promising pilots/build on earlier R&I results, and c) Providing data services (for e.g. farmers, administration, start-ups). Therefore, feature of the partnership instrument, which are particularly relevant for the implementation of the Partnership Agriculture of Data are:

- A partnership has the possibility of sustaining and maintaining achievements through a longer funding cycle and after the funded lifetime, leading to a greater long-term impact.
- A partnership can go beyond ‘normal’ Horizon Europe Work Programme topics in coverage, outreach and achievements; within its systemic architecture it can embed more actions than ‘only’ calls and it allows for setting up “Strategic framing actions”.

While in “normal” Horizon topics regularly the development of geospatial data-based solutions is carried out at case region level, this **partnership aims at Europe-wide coverage**: Firstly, it will be essential to cover all biogeographic zones in Europe to generate data sets and subsequently knowledge for climate adaptation strategies. Secondly, if data-based solutions developed under this partnership are to be used for monitoring and evaluating common policies, data sets have to be available for all Member States. Thirdly, the partnership aims to provide data-based solutions for all farmers in Europe; geographical digital divides are to be avoided.

### 3.3.4 Expected EU added value

The Partnership Agriculture of Data is expected to create significant EU added value. The following aspects are to be highlighted in particular:

- **“Umbrella effect”**: The partnership is expected to consolidate and link the efforts of already performed and ongoing use cases and pilot projects in the field of the development of (EO) data-based solutions for the agriculture sector and policy monitoring. Dedicated review mechanisms will be set up to capitalise the consolidated results and works of projects across Europe and to foster excellence.
- **“Defragmentation”**: The partnership will contribute to “Defragmentation of the landscapes” initiatives in the field of EO, other environmental and agricultural data, which are currently frequently ongoing in parallel. Mechanisms for tailored interaction will be set up to achieve scale-effects through common approaches, and avoid the duplications of efforts.
- **“Systemic effects”**: This partnership is expected to achieve systemic effects in the provision of data-based solutions through – among others- the upscaling of piloted approaches and the creation of sustainable governance and service structures.
- **Effectiveness and efficiency in data processing**: Due its geographical outreach, this partnership will achieve the “critical mass” of the provision of (geospatial) reference data sets needed for the effective application of “Big data” technologies.

- **Coverage for climate adaptation:** This partnership will cover several biogeographic zones. To have reference data from agricultural production from various biogeographic zones is a key asset for the development of climate adaptation approached for the sector, as there will be a shift in production conditions, and lessons can be learnt from regions affected by similar conditions in the past.
- **Uptake and integration of monitoring approaches:** Due to the direct involvement of all/ the majority of Member States in the partnership, the uptake of the results of the partnership and their integration into monitoring and evaluation processes of Common policies, will be facilitated. This will include the integration of the user-centric/social dimension.

For achieving many of the above listed EU added values, it will be essential that **all/most of the countries in Europe join the partnership**. A key ambition of this partnership is covering whole Europe and to create data sets while avoiding “white spots” in the provision of independent data services to the agriculture sector, policy-makers and public administration as well as to other stakeholders.

### 3.4 Partner composition and target group

#### 3.4.1 Building on and expanding existing cooperation

This partnership has not one main domain at its centre, but the interests and capacities of four domains: 1) agricultural production/farmers and 2) policy monitoring and evaluation, on the targeted end-user side, and 3) EO, other environmental and agricultural data, and 4) digital & data technologies as means.

The ambition behind the AgData partnership is that this new instrument can provide a way to connect these domains as smoothly as possible to achieve a higher standard of transdisciplinary research and innovation as well as strengthening European countries/regions policy monitoring and evaluation. Furthermore, with the inclusion of several sectors, this partnership has the capability to interact with new types of partners both private and public, as well as to enable innovative working methods equally relevant for the different domains.

With that, AgData has the unique ability to build on and expand existing cooperation and gain from national strongholds on the common EU goals. In the four domains covered by the partnership, many activities have been ongoing over the last decade, which gives the partnership a wide variety of new partners and networking possibilities. The cooperation activities range from co-funded ERA-Nets to many projects conducted in the context of Horizon 2020/Horizon Europe, the Common Agricultural Policy or Copernicus (the European Earth observation and monitoring part of the EU Space Programme).

#### 3.4.2 Type and composition of necessary partners (including new partners)

Member State and Associated Countries can become partners in this partnership. To ensure the achievement of the goals set by the partnership, especially in terms of a sufficient geographical coverage and structural and long-term impacts, a large part of Member States and eligible Associated Countries (preferably all) will be invited to join the partnership. The (one or more)

services to include in the partnership mandated by each country could range from ministries of agriculture, research & innovation and environment, but also consist of paying agencies, RPO’s and national space agencies. In addition, representatives of relevant expert-/working groups as well as universities and RPOs would ensure dedicated attention to the research and innovation related actions within the partnership.

To allow for the independence of the partnership and following the common approach taken with co-funded partnerships, it is not foreseen that private sector actors become formal partners in AgData. Ways how stakeholders can be involved without conflicts of interests and inducing dependencies (e.g. through offering data sets and/or the testing of data-based solutions) needs to be further explored jointly with relevant umbrella organisations on the basis of this document.

As the partnership is targeting the domains of sustainable agriculture, policy-monitoring and evaluation, Earth and environmental observation and digital & data technologies, it will be key to ensure that within the composition of the partnership, all of the four domains are reflected in the advisory bodies. The partners should ensure a proper representation in the bodies and actions of the partnership of all of the four domains.

For this partnership, countries (Member States/Associated Countries) are proposed to co-fund the partnership: No private sector involvement in financing the partnership is foreseen to ensure independence of the work of the partnership, which does not imply that stakeholders, including businesses, will not play a key role in the implementation of the partnership (see chapter 4). Further reasons to assign the lead and co-funding of the partnership to countries, include:

- Countries play a key role in possible decisions on the provision of certain reference data needed for the application of data technologies;
- Countries play a key role as end-users of (EO) data-based solutions, especially in the field of policy monitoring and evaluation;
- For monitoring and evaluation data, a key interest is to ensure continuity of data provision;
- Within the work of this partnership, R&I actions are framed by “strategic actions” to be carried out by countries (Member States/Associated countries).

Ways how stakeholders can be involved without conflicts of interests and inducing dependencies (e.g. through offering data sets and/or the testing of data-based solutions) needs to be further explored jointly with relevant umbrella organisation on the basis of this document.

The following options might be considered:

- Stakeholders are part of a consortia answering to one or more external calls;
- The partnership gathers farming data, through a data marketplace, whereby farmers may donate data for R&I purposes. The advantage of this option is, that trusted data sharing mechanisms would be in place, and the partnership would not need to duplicate efforts. This could e.g. be achieved through the structures to be established through the Common European Agriculture Data Space.



A community of stakeholders/a community of practice would be set up and regularly brought together and asked as a ‘test bed’ for solutions. The same group or a working group under the advisory board of the partnership will supplement the work under the SRIA and discuss proposals for and/or priorities in new concrete actions/activities to be undertaken within the partnership in the field of data-based solutions for farmers.

Strategic framing actions to be initiated by countries can include<sup>46</sup>:

- Data provision to partnership actions (e.g. provision of reference data sets for the use of AI);
- Ensuring consistency (in data sets/approaches) across Europe within the domains covered by the partnership;
- Linking and adding up to data provision services (for e.g. farmers, administration, start-ups)<sup>47</sup>.

Countries also have the opportunity to programme policy instruments, which are under share management, such as the Common Agricultural Policy (CAP) in a way to achieve best synergies with the implementation of this partnership, as outlined in Sub-section 4.1.2. Beyond this partnership, countries also contribute to the programming of other EU level instruments which are expected to go hand in hand with this partnership, this concerns for instance many measures under the DEP (see Sub-section 4.1.2).

### 3.4.3 Target groups and stakeholder community beyond the partners

When implementing large complex information technologies and infrastructures across multiple different stakeholders one key challenge is to ensure that all relevant stakeholders, their motivations, interests, and practices are considered in the actual design of the technological solutions. In order to have a successful implementation of the technology solutions it is vital that each of these different types of target groups are recognised as essential part of the socio-technical infrastructure, and to acknowledge that they do not share the same motivations and interests.

Although not involved as partners, stakeholders in the agro-food value chain including (EO) data providers are important in achieving the goals of the partnership and especially in ensuring the longer-term impact, uptake and sustainability of the results coming out of the partnership. For instance, the partnership may also contribute to increasing societal acceptance through the provision of information on sustainably production to consumers.

Therefore, it is essential to strongly involve private organisations and end-users, in particular the farmers. Considering the service orientation of the partnership and the potential need for the use of data generated by commercial companies, connection to private sector actors (end users and

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<sup>46</sup> The set of Strategic framing actions foreseen to be carried out by this partnership would not be implementable under an ERA-NET, where a set of concerted call is implemented. Moreover, the declared objective of maintaining the provision of data-based solutions after the funded lifetime of the partnership, is a difference to the ERA-NET approach.

<sup>47</sup> A concrete example, for the possibility to link or add up to data provision services, is the possibility to provide additional input data to the Farm Sustainability Tool for Nutrient Management (FaST) to be provided by Member States for farmers under the CAP post 2022.

others) to the partnership is foreseen. This can range from farmers, advisory and machinery companies that could play a role in the testing of data-based solutions to the provision of reference data to service providers (e.g. innovative start-ups and (EO) data providers) to ensure further capitalisation of data sets/data-based solutions. The involvement can possibly be secured with an Advisory Board with strong or maybe even pure agriculture and industry commitment. To achieve the best results, it will then be essential to include the Advisory Board extensively along the partnerships lifetime

Furthermore, the involvement of stakeholder- or umbrella groups, such as nature conservation or landowners’ organisations, could be considered. This can range from data-providers to farmers cooperations, advisory groups and environmental organisations and can include:

- Farmers and the wider farming/rural community, including farmers’ representatives;
- Members of the Agricultural Knowledge and Innovation System (AKIS) at national and regional levels (including relevant research stations and experimental farms);
- Other food chain stakeholders: industry/SMEs (input providers/machinery/precision application systems/plant breeding, etc.), citizens, processors, etc.;
- National, regional or local public authorities;
- App/software developers/service providers/data-based solutions providers;
- NGO’s, environmental (action) communities.

The scientific community (whether through universities, RPO’s or otherwise) is a particular group to take into consideration, concerning the R&I aspects of the partnership.

Next to the different private/commercial partners, the partnership is expected to benefit from the collaboration with (initiatives led by) relevant pan-European agencies, including the European Space Agency (ESA), the European Environment Agency (EEA), EUSPA (European Space Programme Agency) and the European Union Satellite Centre (SatCen).

In addition, establishing active links to the consortia leading relevant EU-projects in one of the four domains or groups leading national initiatives of interest to this partnership would be preferred and is encouraged. Synergies with other EU level initiatives, such as the Common European Agriculture Data Space, Destination Earth and other Horizon Europe partnerships are described in Sub-section 4.1.2.

#### 3.4.4 International dimension

The main geographical focus of the partnership is within Europe, with reference data sets covering Europe and common approaches to some extent already established e.g., in the context of Copernicus. Furthermore, the partnership will contribute to the monitoring and evaluation of common policies within the EU. This is not withstanding that the partnership is welcoming the uptake of its results beyond Europe as well as synergies with relevant international organisations, such as GEO (Group on Earth Observations).

Where relevant, the partnership is open to international collaboration with countries or international organisations, with expert knowledge in the field of development/policy-making or other domains targeted by the partnership.

This can support Europe to share ideas, progresses and impacts, and finally achieve the development of a more sustainable agricultural system with the use of data and digital technologies in general, leaving no one behind.

## 4. Planned Implementation

This section gives a general overview of the planned implementation of the partnership. It will be supplemented at a later stage by a SRIA (see Sub-section 3.2.5) and a partnership proposal to be submitted by a consortium of partners to apply for a partnership under Horizon Europe.

### 4.1 Activities

#### 4.1.1 Portfolio of activities

For the implementation of the Partnership Agriculture of Data, two main types of actions can be differentiated: **a) Core actions** and **b) Strategic framing actions**. Both types of actions are supplemented by (additional) management, governance, administrative and communication/outreach and networking actions.<sup>48</sup>

**Core Actions** (whose details will be developed through the SRIA) will, as it can be expected for an initiative under Horizon Europe, cover in particular Research and Innovation (R&I) activities<sup>49</sup> organised primarily through external calls, but not excluding internal calls. For the capitalisation of R&I actions, this partnership also follows the ambition of upscaling and delivering end-user tailored innovative data-based solutions.

**Strategic Framing Actions** (see non-conclusive list below) are essential to ensure and increase effectiveness of the Core actions carried out under the partnership. They can be divided into two groups.

- Strategic Framing Actions organised as in-kind contribution. The countries themselves decide how the contribution is provided;
- Strategic Framing Actions organised as internal calls. Members of the partnership are eligible.

In order to implement Core actions and Strategic framing actions, **Administrative activities** are required. Administrative activities (such as Call Office works, evaluation, and monitoring) are either organised through internal calls or by direct allocation from the partnership budget.

**Core actions** will include in particular:

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<sup>48</sup> For instance, while the partnership itself has overarching management actions in its work programme, management actions will also be carried out within the implementation of external calls. Moreover, some of the Strategic framing actions could e.g. also be classified as management and coordination actions. Yet, they are highlighted here as Strategic framing actions, as they are specific for this partnership.

<sup>49</sup> With reference to the “Horizon Europe-Work Programme 2021-2022-General Annexes” it should be considered that Research and Innovation activities include Research and Innovation actions (RIA), Innovation actions (IA) and Coordination and Support Actions (CSA)

- Research and Innovation projects that address the needs identified in the SRIA; The exact content is to be determined during the SRIA process, but conceivable elements/subjects are e.g.:
  - Development of novel reference data sets;
  - Development of innovative data-based solutions for farmers and for policy monitoring;
  - Development and use of novel techniques in EO-based mapping and monitoring;
  - Capitalisation of sensor data generated on farms for the benefit of the wider farmer community;
  - Development of innovative business and governance models for sustainable management of data flows.
- Upscaling of promising pilots/building on earlier results within the partnership<sup>50</sup>, including for instance, geographically (from use case level to EU-level) or from innovation to deployment;
- Providing data services (for e.g. farmers, administration, start-ups).

As the partnership aims at being sustainable after the funded lifetime (see Section 4.3), ensuring and testing the functionality of upscaled solutions and data service provision as well as the development of innovative business models serving public and private interests will be an important element.

The partnership instrument allows to go “beyond the implementation of a set of coordinated calls” in the portfolio of activities. This opportunity is important for the Partnership Agriculture of Data, for which the set-up of Strategic framing actions is essential to achieve its objectives. Strategic framing actions can also provide a bridge between research and innovation on one side, and users on the other side, by creating infrastructure making the results of research projects available to end-users<sup>51</sup>. In Section 3.4, the crucial role of countries in the implementation of the partnership was explained. The direct involvement of governmental organisations is not only important to ensure the uptake of the results in policies, most noteworthy in monitoring and evaluation schemes, but also for tailoring and feeding R&I activities and ensuring their upscaling, implementation and maintenance after the funded lifetime of the partnership.

**Strategic framing actions** to be carried out within the partnership may include:

- Identification and communication of policy monitoring and evaluation data needs and taking an active role (feedback mechanisms) in the R&I based development of related data-based solutions to ensure suitability for policy uptake;

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<sup>50</sup> In the upscaling of promising results or pilots, not only projects carried out within the partnership are considered, but it is aimed at - as outlined under the point “Umbrella function” to link and review several types of past and on-going projects falling within the scope of the partnership.

<sup>51</sup> As outlined in Sub-section 4.1.3 on synergies, it will be important for the partnership to link up to existing capacity building initiatives for end-users, such as AKIS, digital innovation hubs or training supported under the Common Agriculture Policy

- Data provision to partnership actions (e.g. provision of reference data sets (in a certain format) for the use of AI);
- Ensuring consistency in the approaches across Europe within the domains covered by the partnership (see also Sub-section 4.1.3);
- Linking and adding up to data provision services (for e.g. farmers, administration, start-ups);
- Umbrella function in bringing multiple initiatives on different levels (national/European) together (see below);
- Working towards ensuring sustainability of the partnership, shaping and linking the implementation of partnership actions accordingly and build the necessary capacities.

### **Action lines to be further developed in accordance with the SRIA and the governance**

The roll-out of some activities will depend on the final scope of the SRIA, the final chosen governance and which funding mechanisms can be used. These activities are still very important and are outlined below.

High potential is seen in the use of data generated through (precision) farming to be used as reference data to capitalise satellite data through the application of data technologies. Therefore, the cooperation with the farming and machinery sectors are not only essential to ensure uptake of the data-based solutions of the partnership. The exact modes of this cooperation beyond the presence of relevant stakeholders in the governance structures (see Section 4.4) and will also depend on the final financial mechanism opted for (see Section 4.2)<sup>52</sup>.

As it is described in Sub-section 3.2.5, the SRIA is developed based on an in-depth gaps- and needs analysis. It will be important that actions defined under the SRIA allow for sufficient flexibility to account for the technological advancement, which is significant in digital and data technologies and data products offered up to the start of and in the lifetime of the partnership. A key activity of the partnership will be achieving the umbrella effect of linking and reviewing related R&I activities, drawing lessons learnt and subsequently tailor new R&I activities on data-based solutions to achieve the objectives of the partnership and scale-up those which were reviewed as successful and relevant for end-users.

Moreover, the legal framing conditions will significantly change until the launch and during the lifetime of the partnership. With the Headline Ambition “Fit for a Digital Age” the Commission has announced a set of legal acts in the field of digital and data technologies, including a Data Act, a Data Governance Act, a Horizontal Act on AI, an Implementing Act on High Value Data Sets and a Digital Markets Act. As outlined in Table 4.1, as far as it can be judged at the current stage (legal processes are still ongoing), the cross-sectoral acts are relevant from both perspectives – the agriculture sector and R&I. The partnership not only has to consider the results of the legal

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<sup>52</sup> Ways how stakeholders can be involved without conflicts of interests and inducing dependencies (e.g. through offering data sets and/or the testing of data-based solutions) needs to be further explored jointly with relevant umbrella organisations on the basis of this document. For instance, such cooperation could be achieved either within calls under Horizon Europe, or through EAFRD co-programming or through institutionalised cooperation with stakeholders.

processes but can also inform its implementation in the fields falling under the scope of the partnership. For instance, it can demonstrate how data sharing tools, such as in support of data altruism introduced through the Data Governance Act, of certain High Value Data Sets can be used in practice. The partnership may also – where applicable – contribute to further development of legal initiatives.<sup>53</sup> In Table 4.1 it is illustrated how legal processes will go on in parallel to the development and implementation of the partnership.

The partnership will not dedicate special attention to the development of standards, but rather aim for synergies with corresponding EU level initiatives (see next Sub-section 4.1.2)<sup>54</sup>.

**Table 4.1: Overview of selected forthcoming legislation relevant for the implementation of the Partnership Agriculture of Data**

	Agriculture	R & I
Data Governance Act	Very relevant	Relevant
Data Act	Very relevant	Partly relevant
Digital Markets Act	Possibly relevant	No direct relevance
Implementing Act on High Value Data Sets	Relevant	Very relevant
Horizontal Act on AI	Directly relevant for agricultural administration and for agriculture sector through machinery directive/regulation	(Very) relevant*

#### 4.1.2 Complementarity with other activities at EU level

The AgData partnership can be regarded as a R&I instrument using data technologies to capitalise EO, other environmental and agricultural data to develop innovative data-based solutions for sustainable agricultural production and policy monitoring and evaluation. It can also be seen as a cornerstone in building capacities for the digital transformation of the agriculture sector. Therefore, when mapping synergies with other EU level initiatives, it is important to look beyond the support to research and/or innovation (see Table 4.2).

Achieving complementarity with other EU activities and their synergetic capitalisation is an inherent ambition aimed for by the Partnership Agriculture of Data. Next to relevant R&I activities under Horizon Europe, among other activities in the field of agriculture and environment supported under the Digital Europe Programme, and innovation- and knowledge related activities carried out

<sup>53</sup> For some of the legal acts early review mechanisms are proposed.

<sup>54</sup> While the partnership does not have the work on standards and interoperability challenges as primary objectives, it may work on related aspects, if that enables the partnership to achieve its objectives (e.g. if certain reference data sets are needed at EU level), as long as other EU initiatives are not working on exactly the same question.

under the Common Agricultural Policy (CAP) are to be considered. Moreover, synergies with the works of the European agencies in the space domain (e.g. ESA and EUSPA) and the European Environment Agency are to be achieved.

Table 4.2 on page 43 provides an overview of the timelines of particular relevant activities.

### Horizon 2020/Horizon Europe

As outlined in Sub-sections 3.3.4 and 4.1.1, this partnership aims to achieve an umbrella effect and to link and build upon the results/outcomes of relevant Horizon 2020 and Horizon Europe projects<sup>55</sup>. For the first Work Programme of Horizon Europe Cluster 6, one call was programmed to be directly linked to the partnership and address a crucial research question:

*HORIZON-CL6-2022-GOVERNANCE-01-11: Upscaling (real-time) sensor data for EU-wide monitoring of production and agri-environmental conditions*

Under Horizon Cluster 4, a number of topics which develop data technologies and approaches to safer data sharing, and data security following a cross-sectoral approach and potentially in the field of space research, will be relevant to be observed and link up to.

The partnership will also continuously map the possibility for synergies with other Horizon Europe partnerships and missions, in particular with the three forthcoming partnership under Horizon Cluster 6 on Food systems, Agro-ecology and Living labs, and on Animal Health and Welfare. Because of the generally rather horizontal focus of the Partnership Agriculture of Data from a thematic point of view, it will only be possible to identify many links after the definition of topical priorities in the SRIA. For instance, as long as it is not certain, whether livestock data will play a role in the partnership and which role soil data will play, it will be difficult to describe synergies with the partnership for Animal Health and Welfare, and the Soil mission. Under Horizon Europe Cluster 4, in particular the potential for synergies with the European Partnership on Artificial Intelligence, Data and Robotics is to be observed.

Due to its specific approach from a methodological point of view – with the main approach being the generation of data-based solutions at EU level through the use of data technologies, there is little risk of direct overlaps with the work of other Horizon Europe partnership.

At the current stage, potential for achieving synergies with the Partnership on Agro-ecology and the Soil mission is seen in the possible use of living lab structures foreseen to be established under those two initiatives, to test data-based solutions developed under the Partnership Agriculture of Data. Similarly, such testing could be done in cooperation with Digital Innovation Hubs or the Testing and Experimentation Facilities to be funded under the Digital Europe Programme (see below).

### Digital Europe Programme

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<sup>55</sup> For the results of a mapping of relevant Horizon 2020 and other projects, see Annex II.



It will be very important to align the implementation of the partnership with the roll-out of the Common European Agriculture Data Space, announced under the European Strategy for Data, and to be supported under the first (2021-2022) and second work programme under the Digital Europe Programme (DEP) (see Table 4.2). The data space aims to support trustworthy data sharing in the sector. Within a Coordination and Support Action an approach towards data sharing in the sector under consideration of the changing farming conditions induced by the forthcoming Data Act and Data Act will be developed. The data space will potentially provide a pool of reference data to capitalise satellite data through data technologies. Depending on the data sharing regime, farm data may be bought in by “innovators” or farmers may donate it for common good purposes. R&I activities under the partnerships can elaborate and highlight the use potential of the data space.

To avoid overlaps with the work on the Common European Data Spaces and actions which may result from the Data Governance Act and the Data Act, the partnership will not concentrate on questions related to data interoperability and standards.<sup>56</sup>

Cooperation with other data spaces, which will develop in parallel to the partnership, as well as with DestinationEarth, which will develop digital twins of the Earth, is to be envisaged. Here a regular mapping of work programmes will be essential.

Synergies with other activities are to be achieved as well, for instance with the Testing and Experimentation Facilities for AI in agri-food, on which data-based solutions might be tested. Furthermore, Digital Innovation Hubs may support the partnership serving as testbed, and as demonstration example, and multiplier to end users. Digital Innovation Hubs may also further capitalise data sets generated by the partnership.

### Common Agricultural Policy

With the Common Agricultural Policy, synergies are to be achieved particularly in two fields: strengthening monitoring and evaluation capacities; and capacity building for the digital transformation of the sector in support of sustainable agricultural production (see Table 4.3).

To respond to monitoring needs and ensure uptake of partnership results in this field, not only the involvement of country representatives is important (see Section 3.4). It will be crucial to regularly exchange with the European Evaluation Helpdesk and the Member State Expert Group for Evaluation (GREXE); exchanges with both bodies took place in the development of the partnership (see Annex IV). In addition, a continuous mapping of relevant Technical Assistance projects will be important to achieve best synergies. While the partnership can support the simplification of monitoring approaches, it can also inform the development of future monitoring schemes, or provide short-term support, e.g. in the field of monitoring eco-schemes in the field of precision farming.

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<sup>56</sup> For all Common European Data Spaces, common building blocks will be defined. For the Common European Agriculture Data Space, minimum interoperability standards might be defined. The European Innovation Board, which will be introduced through the Data Governance Act, will work on questions related to cross-sectoral data interoperability. To avoid overlaps with those EU level initiatives, the partnership may not foster works on interoperability. This does not imply, that the partnership may not work on data interoperability at all, e.g. in cases where an EU-wide reference data layer is needed and data formats vary across countries.

The CAP provides key instruments to support the digital transformation of the sector at the level of the end-user (see Table 4.3), including advisory services, training, investment support, demonstration projects, support to cooperation, innovation and knowledge transfer. The exact use of these instruments to support the transformation process will be decided by Member States within their digitalisation strategies as part of their CAP Strategic Plan (see next sub-section). The partnership is to supplement those CAP instruments, which primarily focus on capacity building and deployment support at the level of the end user, through R&I at systemic level taking end user needs into account and linking up to mechanism reaching out to farmers. Two examples of possible synergies can be named: the partnership can produce additional input data layers to the Farm Sustainability Tool for Nutrient Management (FaST) made available to all farmers; and the partnership can feed practitioner-oriented knowledge into the Agricultural Knowledge and Innovation Systems (AKIS).

### EU Space Programme

The EU Space Programme and specifically the Earth observation and monitoring part Copernicus, provides, maintains and promotes the use of space data. In addition, the EU Space Programme focusses on the technological development of satellites for different purposes as well as on the development of infrastructures, services and applications.

The partnership can benefit from data, information and services delivered under the EU Space Programme/Copernicus and contribute to and support the deliverance of accurate and reliable Earth observation data, information and services in the domain of agriculture.

### Other initiatives

There are several other initiatives at EU level with which synergies are to be achieved. As already mentioned, close collaboration with the European agencies in the space domain and the European Environment Agency will be an asset; this includes the achievement of synergies with the EU Space programme, in particular as it regards the development of monitoring approaches and promotion of the uptake Earth observation-based data products by end-users and innovative start-ups. Collaboration with agencies will be achieved through dedicated governance structures (Section 4.4). Collaboration will also be envisaged with the Knowledge Centre for Earth Observation (KCEO), which may serve as multiplier of partnership results). Linkages to EuroGEO regional initiative are to be further explored.

Synergies could also be sought with relevant activities of the European Environment Agency (EEA) and its Environmental Information and Observation Network (Eionet). The work carried out by EEA in the context of indicator and knowledge development for policy support and strengthened monitoring regarding agro-ecosystems, agriculture and food systems and relevant policies is also particularly relevant. Synergies could also be achieved with EEA’s Copernicus User Uptake activities aiming at strengthening communication, dissemination and capacity building on Copernicus products. And relevant activities planned by EEA in the context of its contribution to EuroGEO on improving access to *in-situ* data regarding rural landscapes, agro-ecosystems, agriculture, food systems.

Possible cooperation at European level in the field of cloud infrastructure is still under investigation and will also depend on the allocation of resources and type of contribution by countries (see Section 4.2). The work of the partnership is to be well aligned with other activities in the Coordinated Plan of AI. That the partnership forms an inherent part of the Coordinated plan on AI, should facilitate achieving synergies with Member States’ AI activities. The development of INSPIRE activities and the revision of related legislation is to be observed by the partnership to continuously make best use of the data sets made available under INSPIRE.

Another initiative to be followed by the partnership is the establishment of a Farm Sustainability Data Network (FSDN), which is to evolve from the Farm Accountancy Data Network (FADN) and will include many farm-level statistical information, especially in the field of farm economics, but also on agri-environmental matters.

Similarly, as the collaboration with Digital Innovation Hubs described above, the partnership may link up to regions active in relevant fields supported under the Smart Specialisation window of the European Regional Development Funds; some regionals have already proactively contributed to the partnership development process.

#### 4.1.3 Achieving coherence and synergies with national policies, programmes and activities

The mapping and monitoring of evolving and newly upcoming initiatives at EU level described in the previous sub-section, has to be similarly carried out at national level to achieve best synergies. Such mapping has already been carried out in the development of the partnership (see e.g. Annex II). In the implementation phase of the partnership, this will be facilitated through dedicated governance structures, with so-called mirror groups in countries (see Section 4.4).

As outlined above, Member States have the opportunities to achieve synergies between the implementation of their CAP Strategic Plans, with the digitalisation strategies, FaST, and AKIS, in particular, and this partnership.

**Table 4.2: Interplay with selected EU level initiatives and indicative timeline**

	1H/21	2H/21	1H/22	2H/22	1H/23	2H/23	1H/24	2H/24	1H/25
Horizon 2020 projects	operating	operating	operating	operating	operating				
Horizon Europe projects		Calls	Launch	operating	operating	operating	1. results	1. results	Results
“Key” Horizon Europe project*		Call	Call	Launch	operating	operating	operating	1. results	1. results
<b>Partnership AgData</b>	<b>Prepare</b>	<b>Prepare</b>	<b>Prepare</b>	<b>Prepare</b>	<b>Launch</b>	<b>operating</b>	<b>operating</b>	<b>operating</b>	<b>1. results</b>
Common European Agricultural Data Space		Call	CSA***	CSA***	CSA***	CSA*** Call	IA** Space	IA** Space	IA** Space
Data Governance Act	Discussion	Negotiate	Adoption						
Digital Markets Act	Discussion	Negotiate	Negotiate/ Adoption						
Data Act			Proposal						
Implementing Act on High Value Data Sets			Proposal						

Note: \* HORIZON-CL6-2022-GOVERNANCE-01-11: Upscaling (real-time) sensor data for EU-wide monitoring of production and agri-environmental conditions

\*\* IA – Implementation Action

\*\*\* CSA – Coordination and Support Action

**Table 4.3: Complementarity with selected EU level Policy instruments in support of the digital transformation of the agriculture sector\***

Policy Programme	instrument/	Scope	Examples	Comments
<b>Horizon Europe/Horizon 2020</b>		<b>Research Innovation</b>	<b>&amp;</b> Partnership Agriculture of Data Dedicated calls/projects	Under Horizon Europe, especially Clusters 4 and 6 are relevant
<b>Digital Programme</b>	<b>Europe</b>	<b>Innovation Deployment</b> Capacity building	<b>&amp;</b> Digital Innovation Hubs Testing and Experimentation Facilities for AI Common European Agriculture Data Space Advanced digital skills	Network of Digital Innovation Hubs in agri-food expected to proactively link up to other relevant EU initiatives
<b>Common Policy</b>	<b>Agricultural</b>	<b>Application &amp; Capacity building</b> Innovation	Advisory services Training Investment support AKIS EIP AGRI	Link to Horizon Europe through EIP-AGRI  Programming primarily at national level through CAP Strategic Plans
<b>EU Space Programme</b>		<b>Technological development, services and applications</b>	Copernicus for Earth observation and monitoring Gallileo/EGNOS for satellite navigation	Copernicus (including data and service products) important for this partnership  R&I activities under Horizon Europe Cluster 4

\* Please, note that in this table on selected EU policy instruments are listed; other potentially relevant instruments include e.g. the Connecting Europe Facility (CEF), and the Recovery and Resilience Facility (RRF)  
AKIS: Agricultural Knowledge and Innovation System  
EIP-AGRI. European Innovation Partnership for Agricultural productivity and Sustainability

## 4.2 Resources

### 4.2.1 Type and level of contribution of the partnership

#### 4.2.1.1 Context

Clear commitment to continuously contribute to the partnership as planned is essential for achieving the objectives of the Partnership Agriculture of Data and ensuring its effectiveness and efficiency. This concerns commitments to the provision of resources – financial and/or in-kind contributions -, which are subject of this section, as well as commitment to the implementation of Strategic framing actions, of which not all might be bound to resources (see Sub-section 3.3.3 and Section 4.1). Beyond the partners, it will be important that relevant stakeholders are enabled and have capacities to contribute to the work of the partnership and stakeholders have the opportunity to share their resources without any conflict of interest.

The principal objective of the partnership is to assess existing solutions and propose improvement in the use of input data for the whole territory of Europe in support of sustainable agricultural production and policy monitoring and evaluation.

A joint approach with ideally all European countries involved in the partnership will be capable of achieving the urgently needed breakthrough to increase the sustainability performance and competitiveness of the agriculture sector and to strengthen the capacities for policy monitoring and evaluation in Europe.

#### *4.2.1.2 General overview of type and level of contribution*

The Partnership Agriculture of Data is foreseen as a co-funded partnership where the co-fund owners/partners – in this case “countries”/national public authorities – and the EC are considered the first circle of partners financing activities of the partnership. National resources will be coupled with co-funding from the European Union (EU). The European Union contribution is based on the eligible costs reported based on the Horizon Europe Grant Agreement. The non-reimbursed eligible costs are the contributions from the participating states. Partners can provide financial resources and/or in-kind contributions.

For the first and second grant agreement of the partnership, a € 40 million (years 2023-2024) + € 60 million (years 2025-2027) is reserved at the side of the Commission. These resources can be distributed over the funded lifetime of the partnership of seven years.

In agreement with what has been presented previously, the financial model of this partnership should be a mixed model with “in cash” and “in kind” financing<sup>57</sup>.

Countries can also use resources from other EU funding instruments to provide their contribution to the partnership, e.g. resources from the ERDF, EAFRD, or the Recovery and Resilience Facility.

In addition, without being formally counted to the partnership budget as such, EU policy instruments can be programmed at European and at national level in a way to achieve best synergies with the partnership.

#### *4.2.1.3 Overview of type of activities and costs*

For this partnership for being effective, the data infrastructure, which will allow for the generation and provision of Europe-wide data-based solutions is an asset. Different options to make this data infrastructure available exist, and a final decision can probably only be taken, when countries formally communicated their commitments. For instance, the partnership could be in data infrastructure externally, or it could build upon or link to existing EU data infrastructure, or countries could provide e.g. cloud capacities as in-kind contributions. See Box 2 for examples on possible in-kind contribution, identified on the basis of a survey among countries represented in the Core group. These examples will be further looked at in the context of the further development of the SRIA.

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<sup>57</sup> The principal resources required for delivering on the objectives of the partnership will be in terms of 1) financial “in cash” contributions from countries, 2) “in kind” contributions to carry out the tasks and actions undertaken (positions paid by partners and devoted to some activities of the partnership; etc.), 3) other resources (to be considered as “in-kind” contributions) such as access to Research Infrastructures (RIs) and Data-Infrastructures (DIs), etc.

*Box 2 – Examples of possible in-kind contributions by countries*

*Several datasets are available in different countries participating in the partnership, such as: Agrometeorological data; Crop mapping data related to CAP control (IACS); Agricultural parcels orthophoto images; Drone based field observation; Data on early disease detection; Landscape data (LIDAR system); INSPIRE Geoportals; Soil moisture datasets; Long term ecosystem research networks data and Long term organic agriculture research network data.*

*These and other possible datasets can be shared by partnering countries in order to make them available for the use of AI.*

*Based on the development of the (draft) SRIA and upcoming R&I activities, relevant datasets should be identified. The handling of datasets (including preparation, formatting, analysis, processing and pooling) can potentially be considered as in-kind contribution. The harmonisation of datasets is of importance for achieving the objectives of the partnership in an effective and efficient manner.*

*Furthermore, the provision of the metadata, compliant with the standard formats, associated to the datasets, would be a particular element of importance to be considered as in-kind contribution. Other possible types of in-kind contributions could be data infrastructures and data centre services.*

The decision on the financing of the needed data infrastructure, will also impact the remaining budget.

In terms of the further budget allocation, the breakdown of costs can only be made after the SRIA if finalised. This is one reason, why at the current stage, for the budget items, only estimates under the consideration of the operational objectives to be achieved can be made, in particular where it concerns the costs of cloud infrastructures and in which approach towards the use of cloud infrastructure will be opted for. For instance, partners may provide cloud infrastructure as an in-kind contribution and this will influence the overall budget breakdown. It is expected that key actions including R&I activities<sup>58</sup>, mainly funded through competitive calls, will consume a significant amount of the total budget. A key focal point in this field of action will be on the creation of innovative solutions and their upscaling and provision to the end-users.

As outlined in Sub-section 3.3.3 and Section 4.1, Strategic framing actions, to be carried out by partnering countries will form an essential corner stone of the work of this partnership; this may include e.g. the generation, provision and formatting of reference data sets, and are likely to be achieved primarily through in-kind contributions or internal calls.

Management, coordination and administration-related activities are additional costs to be estimated.

Other activities, mainly related to dissemination, communication etc., will account for the remainder of the budget. Here, it is to be highlighted that this partnership foresees to achieve close collaboration with existing and/or forthcoming knowledge and innovation systems/hubs (see Section 4.1), rather than establishing a “competing” knowledge hub from the scratch. See also Table 4.4 hereunder.

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<sup>58</sup> With reference to the “Horizon Europe-Work Programme 2021-2022-General Annexes” it should be considered that Research and Innovation activities include Research and Innovation actions (RIA), Innovation actions (IA) and Coordination and Support Actions (CSA)

**Table 4.4: Overview of type of activities and indicative budget allocation**

<b>Activity</b>	In-kind	Admin.	External call	Internal call	Total
<b>Core actions</b>					
To be described in SRIA			110		
<b>Strategic Framing actions</b>					
Providing source data	14	2	-	-	
Operating data centers	100	10	-	-	
Testing R&I results				20	
Implementation of R&I results				25	
Harmonization across Europe				10	
Umbrella function				5	
<b>Administrative activities</b>					
Management, coordination and administration-related activities		23			
Communication and dissemination		23			
<b>Total</b>	114	58	110	60	<b><u>342</u></b>

#### 4.2.2 Other forms of resources foreseen

At national level, it is also expected that resources will come from different public funding entities at national level. Partner countries are encouraged to explore the possibilities to use other EU funding programmes, beyond Horizon Europe, such as structural funds (including Technical Assistance resources used for monitoring and evaluation), and the Recovery and Resilience Facility for the co-funding. Moreover, countries are strongly encouraged to programme national instruments and EU instruments under shared management, in a way to achieve best synergies with these partnerships, also for activities, which may not be counted as co-funding. For instance, the Agricultural Knowledge and Innovation Systems (AKIS) under the CAP may proactively link up to the partnership.

At European level synergies with other policy instruments, such as the Common European Data Space) are explicitly programmed (see Sub-section 4.1.2).



## 4.3 Exit strategy

### 4.3.1 Why an exit strategy/the ambition to sustain the partnership and its achievements

The work of the partnership is expected to result in the set-up of a systems which serve as a basis for continuous provision of data flows and data sets, as well as, if applicable, of applications and analyses, primarily serving

- as input for sustainable agricultural production, and
- monitoring of European policies related to the domains tackled by the partnership

The partnership instrument offers the opportunity to have an EU-funded activity running for relatively long time, which is e.g. longer than regular Horizon calls. Yet, also the funded lifetime of the partnership instrument is limited. However, its remit and achievements (delivery and application of agricultural and Earth observation data to ensure sustainability and competitiveness of European agriculture) will exist well beyond the funded lifespan of the partnership and the importance of data in agriculture is very likely to increase even further. Moreover, the opportunities the partnership intends to use will develop and technological advancement, e.g. in data technologies, will provide new possibilities to follow the objectives of the partnership<sup>59</sup>.

For policy monitoring in particular, consistent time series are essential, and the maintenance of related data flows will be essential to capitalise the work of the partnership. Maintenance costs would qualify as general policy implementation costs. Depending on the final scope and nature of the support to the private sector might be provided for free or e.g. as service of capitalised data sets provided through e.g. start-ups (several solutions are feasible here, e.g. also public service to farmers similar to or as an extension of FaST). Generated outputs may also serve other needs, depending on the final scope of the partnership.

### 4.3.2 How to set up the exit strategy

A dedicated Working group will collect ideas and proven methods to maintain the network relations between the partners, preserve and take up the results and to implement these for a continuation of its activities on own costs (in-kind contributions without EC funding).

The objective of the Working group is to establish a durable and focused network in the domain of the Partnership Agriculture of Data from countries (Member States and Associated Countries) during the lifetime of the partnership. This network shall provide a forum leading to improved collaboration on research prioritisation and funding, creating the necessary critical mass and focus to deliver research needs for policy makers and innovative data-based solutions to policy-makers and end-users, farmers in particular.

Further objectives are the development of business models, linking private and public interests.

Moreover, the exit strategy must:

- a) Lay the foundations to continue the work of the partnership (including business models and governance structures);
- b) Develop a strategic outlook;

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<sup>59</sup> Another example could be a membership fee model to be discussed/developed among the keen partners. A deliverable could be a MoU signed by the end of the partnership. A strategic roadmap for a future partnership should be developed.

- c) Ensure the continuation at national and European level of the coordination of research, innovation and data-related activities (linked to and beyond SRIA);
- d) Explore/develop the means for keeping elements of the partnership ‘alive’ after the duration of the partnership.

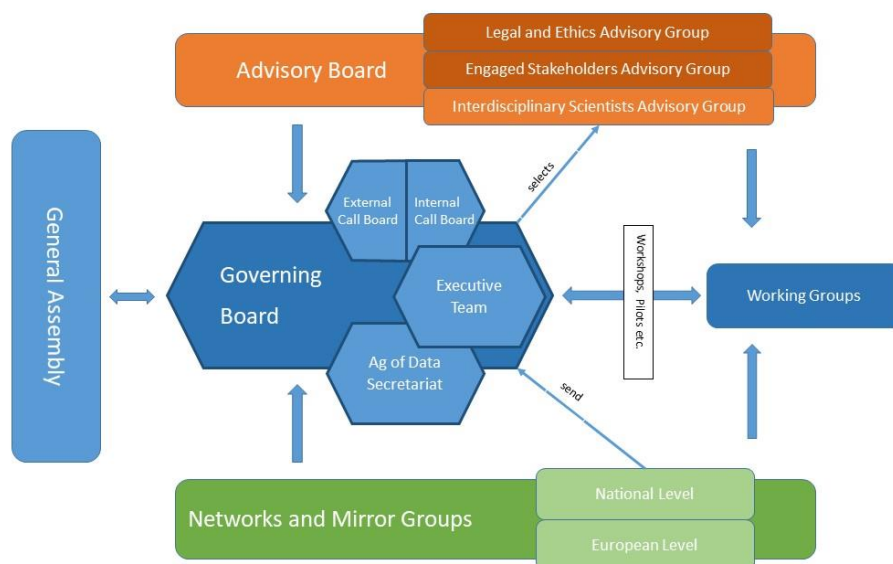
The format and depth of actions together with the different other initiatives is to be discussed. It is noted that in any case, the EU will not continue to co-fund the partnership if it continues its activities beyond the end of the normal 7-year period.

#### 4.4 Governance

A sound governance structure has to be established for the partnership to function in an effective and transparent manner. The proposed governance structures are tailored to the needs of this partnership, ensuring the involvement of all the relevant parties in the implementation of the partnership.

The governance of the partnership will be further refined in 2022/2023. E.g., ways how scientists and stakeholders can be involved without conflicts of interest (CoI) and inducing dependencies, needs to be further explored. It should also be considered that contributions from the partners can be diverse and it will have to facilitate an efficient uptake of the results of the partnership. The proposed governance structures are reflected in Figure 4 and further described hereafter.

**Figure 4: Governance structure of the Partnership Agriculture of Data**



*Blue modules are those relative to the internal structure of the partnership (Operational level); Orange modules represent those structures engaged with the partnership, e.g. participating in the Governing Board, (Strategic level); finally, green modules represent structures with which the partnership is making networking at different level in order to increase the impact (Exploitation level).*

The partnership will base its governance on previously successful models for partnerships and EJPs with following main functions:

*A) Operational Level*

1. General Assembly (GA)

This board is composed of one representative from all MS and AC + EC (signatory of the Grant Agreement). It will meet only for Extraordinary General Meetings (EGM) to take decisions on amendments to the Grant Agreement (e.g., addition of new members, termination of existing partners and amendments to the Description of Action) and takes main decisions through voting on the proposals of the Governing board (GB). Each member will have one vote and a simple majority is needed for an amendment. As all signatories are legally bound by the Grant Agreement (and by any amendments to it), they must have the right to vote on any amendments.

2. Governing Board (GB)

This board is the steering body of the partnership and meets at least bi-monthly. The governance board will consist of 1 (or 2) representatives for each MS/AC and will take most of the decision for managing the partnership. In particular, the GB adopts the annual work program of the partnership, reports to the EC, submits proposals for main decision voting or other decisions to the GA, and fosters the political commitment. The GB elects one chair and 2 vice-chairs for a period of two years. Two representatives of the EC (DG AGRI and DG RTD) and the chairs of the three Advisory Boards will be invited to GB meetings as advisors. Their main role will be to mentor and advise GB on different aspects such as legal, ethical, scientific, technical, professional, social or any other aspect related to their previous expertise. Advisors will also be involved in the discussion on the presentation of new candidates for membership nominated by Member States and Associated Countries.

External guests, may be invited to participate as observers in those meetings in which items of the agenda requires it, including for instance representatives of countries willing to join the partnership in the future.

The GB closely cooperates with the Executive Team (ET; see point 3 below) and it is supported by the Secretariat (logistics, meeting organisation, note-taking, etc.; see point 4 below). GB will be in charge of designating members for the External Call Board (ECB; see point 5 below), right after the submission of the basic structure for external calls by the Working Groups (see point 7 below). Furthermore, the GB will publish open internal and external calls and selects the members of the three Advisory Boards (see points 8a-c below).

Voting of the GB will be defined.

3. Executive Team (ET)

The ET is represented by (vice) co-chairs of the GB and the ADS (see point 4 below). Its main role is to ensure the timely and coherent implementation of the GB decisions, monitor progress and propose future strategies and actions in cooperation with other bodies of this partnership. The ET is expected to meet following the GB meetings schedule and other partnerships' needs.

4. Agriculture of Data Secretariat (ADS)

The ADS will support all bodies within the partnership, particularly on administrative purposes (meeting organisation and preparation of agendas, protocols, tasks related to the

Grant Agreement(s), etc.) and it consists of a secretariat lead and supportive staff. The ADS also ensures the monitoring of the implementation of activities in the partnership.

5. Internal Call Board (ICB)

The ICB is designated by the GB after the proposal of an internal funding call by a Working Group (WG; see point 7 below). Membership will consist of one representative of each country committed to funding of the call and up to three members from the Advisory board (AB) for legal, ethical scientific, technical and social decision support for potential call topics and/or conflicts.

The ICB is in charge of elaborating the call text and setting up the selection process, to ensure transparency. It will moderate the evaluation process of the proposals submitted to the internal calls. The Partnership will ensure that appropriate mechanisms are in place to ensure transparency and to deal with any potential conflicts of interest that might arise.

6. External Call Board (ECB)

The ECB is designated by the GB after the proposal of an external funding call by a Working Group (WG; see point 7 below). Membership will consist of one representative of each funder<sup>60</sup> and up to three members from the Advisory board (AB) for legal, ethical scientific, technical and social (Stakeholders) decision support for potential call topics and/or conflicts. Voting rules of ECB will be defined.

To avoid any conflicts of interests, consultation on the topics must be an open process that does not give advantage to any specific group of future applicants. Under consideration of the results of the consultation, the ECB is in charge of the elaboration of the call text, including the expected outcomes and scope.

Funding decisions are part of a standardised evaluation process, following the generic Horizon Europe rules and conducted by a European Commission's Executive Agency (most likely the Research Executive Agency (REA)).

7. Working Groups (WG)

Working groups are temporary groups that can be set up through a decision by the GB to fulfil specific tasks fundamental to the work of the partnership.

Tasks of dedicated Working Groups can include, the elaboration of the exit strategy, of topics to be proposed to the ICB/ECB.

A WG will be open to at least one member each of the three groups of the Advisory Board (see *B) Strategic Level*). The GB may decide in whether and in which way to involve the other bodies of the partnership and the mirror groups.

*B) Strategic and advising level*

8. Advisory Board (AB)

The AB engages external actors. It has three sub-groups and consists of the delegates of the legal/ethical, scientific and stakeholder groups. The role of the AB is to provide strategic, technical, scientific and ethical/legal advice and suggestions for the partnership; be consulted on the main documents produced by the partnership; review the outputs and impacts of the

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<sup>60</sup> As a general rule it is assumed that all partners (MS+AC) support all external calls. There might be exceptions, for instance where it comes to external calls concerning specifically EU-policies which might be less relevant for AC.

partnership and suggest possibilities for improvement. The AB is invited to meetings of the GB (as advisors), ICB and ECB (as members).

The three sub-groups under the AB will support the partnership as important advisory bodies (e.g. identify gaps and formulate important current issues). The GB will ensure that the composition of the three sub-groups is appropriate for the tasks assigned to them.

These three sub-groups are:

a) Interdisciplinary Scientist Advisory Group (ISAG)

The ISAG consists of qualified scientists from universities or RPOs that cover one or more of the following research fields (the final composition of the ISAG has to cover all of – but is not limited to- the fields): Agronomy, Earth observation, Agricultural technology, Environmental science, Crop science, Soil science, Farm economics and Data science.

Members are proposed by the GB. ISAG will also contribute to the dissemination of information related to the partnership towards relevant scientific bodies and stakeholders. The group meets at least twice per year.

b) Engaged Stakeholders Advisory Group (ESAG)

The AgData partnership comprises of four domains (agricultural production, policy monitoring/evaluation, data, digital & data technologies) that will be represented in the ESAG by a broad range of different stakeholder groups. These groups differ both in the domains covered and in the type of organisations (private and public, including end-users). The ESAG should involve umbrella organisations, representing stakeholders at European level. An additional task of the ESAG will be to support the partnership to identify priorities of future R&I and other activities that the partnership will be asked to develop. The ESAG should meet at least twice per year.

c) Legal and Ethics Advisory Board (LEAG)

This group will include external experts and will address issues related to ethics and legal questions and the use and protection of data. The GB may ask the LEAG for advice on conflict-of-interest issues. The LEAG meets at least twice per year, or on ad-hoc basis if needed. Some decisions of the LEAG may also be taken in the form of a written procedure.

*C) Exploitation and implementation level*

9. Mirror Group Assembly

The mirror groups are:

a) National Level Mirror Groups (NLMGs)

Participating countries are strongly advised to constitute an NLMG, bringing together the national delegates to the GB and national stakeholders, such as relevant ministries, research institutions and agencies. They will ensure that partnership activities, strategies and needs of that country are considered when taking decisions at the partnership level and when designing the annual work plans. The task of the national mirror groups is to enable the communication between national stakeholders and the partnership in both directions. They should follow the partnership progress and activities and contribute to the objectives. NLMGs should be composed of the national delegate(s).

b) European Level Mirror Group (ELMG)

Different actors working on EU policies and priorities connected to Agriculture of Data (already mentioned in Sub-section 4.1.2) will be invited to take part in this mirror group,

animated by the Partnership Agriculture of Data. These actors concern in particular relevant people from Directorates-General within the European Commission and relevant European agencies. They will ensure that partnership activities will not duplicate other European Initiatives on similar issues, but will develop synergies with them. The inputs from other European actors can be important in order to identify relevant topics for internal and external calls and relevant events/workshops. The ELMG is also important to ensure the relevance for European policies and an effective science-policy interface. In this way the AgData community can support the whole European debate on the use of data in agriculture, from a research perspective.

## 4.5 Openness and transparency

### 4.5.1 Transparency in the development process of the partnership

The preparation of the Partnership Agriculture of Data has been carried out in an open and transparent way. The co-creation process started in summer 2020 with the compilation of the fiche “Environmental Observations for a sustainable EU agriculture (Agriculture of Data)”, informing about the context, objectives, impact and rationale of the projected European partnership. The fiche was sent out to representatives of the MS/AC for comments. In parallel to the feedback process on the fiche, surveys and webinars (both for countries and stakeholders) were organised in April/May 2021, in order to take stock of the ongoing initiatives relevant for the partnership, the most relevant objectives to prioritise within the partnership proposal and the proposed research/technologies and services to be used to achieve those objectives. Both webinars and surveys were promoted online to reach out to potential partners as broadly as possible and had a high rate of participation (see ANNEX IV for a full overview).

After the nomination process through the Horizon Europe (shadow) Programme Committee of Cluster 6 in September 2021, a Core group of country representatives consisting of originally 18 MS/AC has taken up in-depth work to elaborate the partnership proposal and the Strategic Research and Innovation Agenda (SRIA). Within two meetings the Core group developed, discussed and adopted the Terms of References of the partnership and elected three representatives as co-chairs. After formal application by a Core group member, the Core group in unison agreed about the admission of two ERA-Nets (ICT-AGRI-FOOD, ERA-PLANET) as contributors to the Core group.

During the development process of the partnership proposal, the number of participating MS/AC increased (see ANNEX I), due to an open and pro-active information and communication strategy with the country representatives. The Core group will remain open to new MS/AC members during its lifetime, and specific efforts will be made to ensure that countries in Europe are sufficiently represented.

In continuation and building on the results of the webinars and surveys, another series of webinars were organised in December 2021. The main aim was to gather feedback from the different stakeholder groups on the interim concept of the partnership proposal and to discuss on the further elaboration of the co-creation process for the partnership proposal and the SRIA. In one webinar, participants included members of the Horizon Europe Cluster 6 Programme Committee (PC), the Standing Committee on Agricultural Research (SCAR) and the GEO High Level Working Group (HLWG). A key element of the webinar was to actively co-create and to encourage engagement in the development of the candidate partnership proposal as well as to request feedback to the background document that was developed specifically for the webinar. Another aspect was to raise interest of countries, which did not join yet.

Another webinar continued to inform and boost the interest of the stakeholder community and gathered a high attendance with more than 200 registered participants from 29 MS/AC as well as third countries.

The further evolution of the partnership development process will continue in an open co-creation process under the guidance of the Core group with active support from the Commission. It will ensure a strong orientation towards both, the potential members as well as the broad stakeholder community. The targeted stakeholder groups that will be continuously involved in terms of consultations and workshops are national ministries and funding agencies, regional and local governments, international and academic institutions, research centres, farmers, farmers organisations and the private sector and companies that are directly or indirectly involved in one of the domains of the partnership (data and digital technologies, EO/environmental observation, sustainable agricultural production and policy monitoring/evaluation). The partnership sees itself as an open organ that enables newcomers to actively participate in its activities and development and to help shape strategies and goals and their implementation.

The partnership will be open to eligible countries (MS/AC) to join at later stage.

#### 4.5.2 Transparency in the lifetime of the partnership

The partnership's activities will build on existing key data sets and where needed produce novel data and data-based solutions. The outcomes and results achieved within the partnership will also include published journal articles, patents, copyrights, etc.

For achieving the aims of the partnership, it is essential to make these results openly available (taking into account valid requirements and regulations, legal foundations and the willingness of user groups to share data and of data donors), so that it can be further used and exploited by as many user groups as possible, such as, farmers, private and public sector, researchers especially also the policy makers, and not least by citizens.

##### 4.5.2.1 Open Data and Open Access

The approaches towards Open Data (OD) and Open Access (OA) are to address the problem of limited access to results publicly funded R&I and accompanied data. Both refer to the practice of providing access to information (in case of OD: data and in case of OA: information/publications) that has no restrictions on its access, enabling anyone to further exploit it and add value to data and research results. Through OD and OA, fuller and wider access to R&I output and data is achieved, which (1) improves the quality of results, (2) fosters collaboration, (3) avoids duplication, (4) accelerates innovation, and (5) improves the transparency of the scientific process.

The approach towards OD/OA in the AgData partnership will be developed in accordance with Horizon Europe guidelines on Open Data and Open Access. As a general rule<sup>61</sup>, it will oblige OD/OA as a standard for the publications and data resulting from the projects in co-funded calls and all subsequent calls. Furthermore, the AgData OA policy will strongly encourage submission of publications and data sets into dedicated repositories.

To keep the results that evolve from the AgData partnership and the accompanied data findable and re-usable for the community they must be described by rich metadata, which follows

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<sup>61</sup> Within the framework of the partnership, exceptions to this general rule might be possible on the basis of justified reasoning (e.g. in the context of IPR and competitiveness).

widely used standard schemes. Use of metadata portals and data repositories which follow the FAIR principles is recommended.

Open data requires not only that the data are technically open, meaning that the data be available for no more than the cost of reproduction and in machine-readable form, but also legally open, i.e. available under an open data usage license that permits free access, reuse and redistribution. For an open and transparent access, the partnership will thus define guiding principles of information and data sharing that build on the FAIR principles, also considering legal foundations, e.g. protection of personal and business data as well as secrecy and confidentiality of sensitive data.

It has to be explicitly mentioned, that such regulations for OD do not cover any kind of background data used or addressed by the partnership that are in the property of natural or legal persons (e.g. farmers, machinery suppliers). Such background data will be handled following the relevant legislation including in the fields of data and property rights; additional conditions to the sharing or the donation of data might be agreed.

One objective of the partnership will be to develop appropriate incentives and business models for data surveying, data updating and data sharing that makes data accessible and usable to many (end-)users (including farmers, public administration, start-ups and other companies, and R&I related actors)). At the same time, those models should also allow for securing the necessary mechanisms and funding for keeping data updated, timely and relevant. Moreover, concepts to the provision of data-based solutions to end-users will be developed.

A compilation of all available, and relevant metadata and results from the partnership and resulting from the calls will be published and maintained on the website of the partnership. A conceptualization of data and metadata semantics will help to obtain value from OD/OA repository and to link it to any other relevant data source. The OD/OA policy and property rights will be made publicly available.

#### *4.5.2.2 Communication activities*

In accordance with the Horizon Europe guidelines, Agriculture of Data will set up a communication strategy with dedicated actions.

All partners need to be involved in communicating the aims and output of this partnership to different audiences. Partners will have to address interested parties in their own countries, ideally in native language(s). The target audience will consist of the same stakeholders as defined under Section 3.4.

The communication activities will include:

- A dedicated website
  - to promote partnership activities, most notably the calls and results;
  - to publish basic information about the funded research projects and metadata of the results (e.g. publications, data sets) generated in these research projects;
  - to disseminate communication material in digital format, to announce workshops and events and to release specific communications via newsletters;
  - to disseminate information on data and results that evolve from the partnership.
- Tailored outreach to relevant knowledge hubs (such as the AKIS, the Knowledge Centre on Earth Observation and the network of digital innovation hubs) as multipliers;



- Policy-science interface activities, strongly fostered and stimulated through the mirror groups at national and European level;
- Presentations at relevant events;
- Communication with coordinators of initiatives relevant to this partnership, for instance Horizon Europe projects;
- Informal communication (mails, phone calls, face-to-face talks) between related European (funding) initiatives (especially other partnerships) to avoid overlap and encourage cooperation between the different initiatives;
- National/regional pre-announcement activities with all stakeholders, through diverse communication channels (e.g., workshops, seminars, national/regional funders websites, regular newsletters, social networks);
- Workshops and seminars with relevant stakeholders to provide information and to support knowledge exchange (including a Kick-Off meeting).

In summary, the partnership will provide access to information, data and results via:

- Generation and maintenance of the website, which will provide a comprehensive overview of all kinds of data and results gathered in the partnership’s activities and other related initiatives;
- Postulation of open access and FAIR principles of sharing data and results dissemination;
- Provision of support and advice to the projects it will fund to improve their capacity to engage stakeholders, to produce policy briefs, to develop data management plans, etc., and
- Implementation of a devoted communication strategy to ensure that its main outputs and impacts are known, widely disseminated, and easily accessible.

#### *4.5.2.3 Pro-active recruitment policy*

The partnership will establish a pro-active policy for the recruitment of a broad range of possible actors. The fundament for this policy is a clear and transparent governance structure (see Section 4.4) that allows for the participation of diverse actors in two main roles, either as members or stakeholders (see Section 3.4 on partnership composition).

Membership of new countries is subject to a positive evaluation by the General Assembly of the partnership.

After the initial call for interest, the membership evaluation and the first establishment of the partnership it will remain open for applications of new members throughout its lifetime and it will pro-actively approach possible new members to ensure a fair geographic coverage across Europe<sup>62</sup>.

In addition to the members, a broad range of stakeholders will have the possibility to participate within the partnership through its Engaged Stakeholders Advisory Group (ESAG, see Section 4.4). By setting-up the stakeholder group through an open and transparent process (open call), the partnership will create favourable conditions to engage all relevant sectors from the society and will ensure that a broad range of actors can effectively participate in its activities.

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<sup>62</sup> Eligibility requirements for new members will be defined at a later stage of the Partnership.

#### 4.5.2.4 *Process to establish annual work programmes*

The process to establish annual work programmes will be guided by the following elements and needs to be fine-tuned by the established partnership and its governance structures:

- Clear and transparent process for developing the SRIA and its annual work programmes;
- Involved bodies as described in the governance section (Section 4.4);
- Open consultation with academic and non-academic organisations in the fields of agriculture, EO and other data, as well as other stakeholders outside the advisory/stakeholder board during each update of SRIA draft;
- Process will be publicly announced to broad range of potential actors and end-users;
- An advisory board, which operates in close interactions with services and initiatives of the EC;
- Consultation process could be implemented amongst the partners in order to suggest possible topics for programmes/calls.

#### 4.5.2.5 *Development of KPIs*

Key Performance Indicators (KPIs) will be developed along with the objectives and the research agenda. The KPIs will allow to monitor the results of the partnership. Their role is partly to support the resource management and implementation of the partnership work programme, but also to provide documentation for the stakeholders regarding the achievements of the partnership.

The general principles for the development of the KPIs are outlined below. The specific KPIs for this partnership will be developed through an iterative process, closely linked to the development of the Strategic Research and Innovation Agenda (SRIA). This process will ensure that measurement and documentation of results are addressed when the research agenda is discussed and force participants to be specific about the expected output and impact of the activities. It is also expected to provide applicable indicators for the achievement of the overall objectives of the partnership.

KPIs can be *quantitative* as well as *qualitative*. Quantitative KPIs will be used when the results can be counted or in other ways measured. Quantitative KPIs require concrete, well-defined objectives, and systematic compilation of data to be used in the reporting. They are useful as indicators of results or development. Measuring quantitative KPIs at the start of a program (baseline) and repeat the measurement during and after an action provides a useful description of the progress as well as the achievements of the program.

Qualitative KPIs are descriptions providing an informed opinion about the status or progress. Some objectives may be difficult to quantify, but qualitative KPIs can still provide useful assessments of the achievement of the activity. Societal objectives and the social impact of an action may be easier to report using qualitative KPIs. However, since qualitative KPIs tend to be assessed subjectively, they need to be defined as precisely as possible. Quantitative and qualitative KPIs can be complementary.

Example of KPI principles that can be used, linked to some of the specific objectives of the partnership:

*Specific objective 2:* Boost the uptake of digital Earth, environmental observations and forecasts data-based solutions, including solutions based on climate predictions and

projections, and data technologies in agriculture, by providing tailored, easily accessible end-user-oriented data-based solutions.

Possible quantitative KPIs for specific objective 2 can be developed from a list of end-user-oriented data-based solutions and the monitoring of the use of these tools. Data collected systematically can be used to report e.g. the number of tools, the number of unique users per tool or how frequently the tools are used.

*Specific objective 4:* Achieve synergies in the development and utilisation of data-based solutions for both the agriculture sector and policy monitoring and evaluation.

It is challenging to quantitatively measure synergies and thus also to provide quantitative KPIs for specific objective 4. A qualitative, descriptive assessment of status and progress regarding synergies is, however, possible.

Further specification of KPIs will be done through an iterative process as part of the development of the Strategic Research and Innovation Agenda (SRIA).

## ANNEXES

- ANNEX I: List of Core group members
- ANNEX II: List of relevant EU-projects for the partnership (Horizon 2020/Copernicus)
- ANNEX III: Preliminary list of key R&I topics and perspectives to be addressed in the SRIA development process
- ANNEX IV: Partnership process
- ANNEX V: List of acronyms

## ANNEX I – Overview of Core group members

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	Julia Gajo	JULGAJ@lbst.dk	The Danish Agricultural Agency/Ministry of Goods and Agriculture
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	Jan Ramboer	Jan.RAMBOER@ec.europa.eu	DG RTD
	Valerio Abbadesa	Valerio.ABBADESSA@ec.europa.eu	DG AGRI

## **ANNEX II – List of relevant EU funded projects (including H2020)**

### Agriculture and data technologies

NIVA	<a href="https://www.niva4cap.eu/project/">https://www.niva4cap.eu/project/</a>
ATLAS	<a href="https://www.atlas-h2020.eu/">https://www.atlas-h2020.eu/</a>
DEMETER	<a href="https://h2020-demeter.eu/">https://h2020-demeter.eu/</a>
AI4EU	<a href="https://www.ai4europe.eu/">https://www.ai4europe.eu/</a>
DataBio	<a href="https://www.databio.eu/en/">https://www.databio.eu/en/</a>
Sen4CAP	<a href="http://esa-sen4cap.org/">http://esa-sen4cap.org/</a>
PANTHEON	<a href="http://pantheonproject.eu/">http://pantheonproject.eu/</a>
AgroIT	<a href="https://cordis.europa.eu/project/id/621031">https://cordis.europa.eu/project/id/621031</a>
ReCAP	<a href="https://cordis.europa.eu/project/id/693171">https://cordis.europa.eu/project/id/693171</a>
Figaro	<a href="http://www.figaro-irrigation.net/">http://www.figaro-irrigation.net/</a>

### Climate Services and agriculture

MED-GOLD	<a href="https://www.med-gold.eu/">https://www.med-gold.eu/</a>
VISCA	<a href="https://www.visca.eu/index.php">https://www.visca.eu/index.php</a>
ClimateEurope	<a href="https://www.climateurope.eu/">https://www.climateurope.eu/</a>

### Environmental observation and agriculture

e-shape:	<a href="https://e-shape.eu/">https://e-shape.eu/</a>
NextGEOSS	<a href="https://nextgeoss.eu/">https://nextgeoss.eu/</a>
FIRE-forum	<a href="https://fire-forum.eu/">https://fire-forum.eu/</a>
EIFFEL	<a href="https://www.eiffel4climate.eu/">https://www.eiffel4climate.eu/</a>
ENVISION	<a href="https://envision-h2020.eu/">https://envision-h2020.eu/</a>
VitiGEOSS	<a href="https://vitigeoss.eu/">https://vitigeoss.eu/</a>
NextLand:	<a href="https://ec-nextland.eu/">https://ec-nextland.eu/</a>

### Earth observation/Copernicus and agriculture

- SENSAGRI <http://sensagri.eu/>
- ECoLaSS: <https://www.ecolass.eu/>
- EO4AGRI: <https://www.eo4agri.eu/>
- BEACON: <https://beacon-h2020.com/info/copernicus-climate-change-service/>
- DIONE: <https://dione-project.eu/>
- DIANA: <https://diana-h2020.eu/en/>
- APOLLO: <https://draxis.gr/projects/apollo>
- FaST Platform: <https://fastplatform.eu/>

## ANNEX III – Preliminary list of key R&I fields of action and perspectives to be addressed in the SRIA development process

Scope of R&I	Current shortage in R&I	R&I perspectives to address shortage
<b>R&amp;I from a more research-oriented perspective</b>		
<b>Data</b>	Lack of uptake of EO, environmental and other geospatial data by practitioners	<ul style="list-style-type: none"> <li>• Identification of data needs and knowledge gaps jointly by the “agricultural, Earth observation and digital and data technologies communities”</li> <li>• Definition of, making available and wide dissemination of “high value data sets” for agriculture across the EU</li> <li>• Conversion of EO data to meaningful and actionable information for farmers and policy makers</li> <li>• Foster reuse of data and use of untapped data sets and their capitalisation through data technologies</li> <li>• Develop concepts and technology for user-oriented entry points/data hubs at MS/EU level that integrate available digital applications at EU level (e.g. FaST)</li> <li>• Investments in purpose-driven digital infrastructures</li> <li>• Generation of data services and portals that implement strict user criteria and security/access levels</li> </ul>
	Heterogeneous and fragmented data landscape in EU	<ul style="list-style-type: none"> <li>• Develop strategies and concepts for data harmonisation (spatial, temporal, semantical) across MS</li> <li>• Ensure alignment with existing data standards or those under development through other initiatives Cross-domain co-operation for the definition and implementation of coherent workflows and classification systems</li> </ul>
	Uncertainty in data ownership	<ul style="list-style-type: none"> <li>• Exploitation of public and private data in synergy in a systematic way</li> <li>• innovation to develop incentive schemes that reward farmers for sharing data (</li> <li>• Establish equitable and simple data sharing agreements with farmers/landowners.</li> </ul>
	Technical and administrative obstacles in data findability,	<ul style="list-style-type: none"> <li>• Develop and build on existing cross-domain standards for findability/interoperability of public environmental information (INSPIRE)</li> </ul>

Scope domain of R&I	Current shortage in R&I	R&I perspectives to address shortage
	accessibility, interoperability and (re-) use  Growing number of uncoordinated meta-data concepts, schemes and portals	and environmental research data (e.g. DataCite) • Develop light APIs for “non-experts” to access and (re-) use environmental data
	Insufficient data quality	• Define minimum requirements (resolution, accuracy, timely availability) of end-users
	Lack of long-term data series and historical data as baseline/target value in the context of monitoring/reporting obligations at MS level (e.g. UNFCCC, SDGs, European Climate Law)	• Development of ex-post data products by exploitation and integration of geospatial historical data sources at different scales • Ensuring continuity in the provision of data sets/data-flows/data-based solutions
	Insufficient valorisation of research data in the agricultural data value chain	• Capitalise data from agricultural long-term field experiments for the development of tailored and reliable data sets
<b>Digital and Data technologies</b>	Lack of adequate digital and data tools for farmers	• Development of machine learning algorithms that address user needs at scales relevant to management practises and decision-making e.g. farm level • Determination of TRLs for a successful implementation of innovative solutions • Develop or build on existing tools for the integration of multiple data sources at user-defined scales and resolution • Development of Lighthouse-Follower model in MS Innovation Hubs
	Rapid technological evolution/progressive change in digital technologies	• Development of agile and flexible data-based solutions for simplified and effective implementation by end-user
	Digital divide between farmers (groups, e.g. small and large farms, countries)	• Development efforts of private sector to be supplemented by publically funded ones to overcome markets gaps (and avoid digital divides)



Scope domain / of R&I	Current shortage in R&I	R&I perspectives to address shortage
		<ul style="list-style-type: none"> <li>• develop data-based solutions which can serve all farmers</li> <li>• Explore the potential of apps to provide simple added value services to small and medium farmers</li> </ul>
	Insufficient end-user orientation in existing data technologies	<ul style="list-style-type: none"> <li>• Mechanisms to match data technology/solutions with user need</li> <li>• build concepts of interoperable apps, where applications will share common data</li> <li>• build added value chain of service organisations that help farmers to transfer data into knowledge</li> </ul>
	Limited off the shelf data technologies than can offer farm level insights/yield projections/forecasts	<ul style="list-style-type: none"> <li>• develop a network of benchmark farms across MSs e.g. cropland, grassland etc. and set of key/standard data inputs.</li> <li>• develop farm specific algorithms – define minimum requirements to develop robust AI models using available data</li> </ul>
	Insufficient integration of predictive modelling in tailored solutions for end-users	<ul style="list-style-type: none"> <li>• Generate or build upon existing data technologies to combine observations, modelled data and future predictions from all relevant sources and types (socio-economic, agriculture, climate, environment, statistics, etc.)</li> <li>• Development of data technologies capable of integrating available data sets (historical and real-time) with ecosystem and carbon/GHG emissions models. Data technologies that can a) provide ‘what if’ scenarios to farmers based on farm level algorithms, and b) demonstrate the added value (e.g. reduced risk of pest incidence) of using such data technologies.</li> </ul>
<b>R&amp;I from an end-user perspective</b>		
<b>General</b>	Insufficient business models for data generation, maintenance, sharing serving both, the private and public sector	<ul style="list-style-type: none"> <li>• Develop concepts/business models for long-term access and (re-)use of data in agriculture under consideration of national/EU legislation, property rights and ownership</li> <li>• Identify common interests for an effective re-use of data and technology by different stakeholders (farmers, food industry, financial sector public sector)</li> <li>• Develop models that maximise return of investment for farmers</li> </ul>

Scope domain / of R&I	Current shortage in R&I	R&I perspectives to address shortage
		<ul style="list-style-type: none"> <li>Public-private cooperation to overcome market gaps</li> </ul>
<b>Agricultural production/ farmers</b>	Lack of adequate and accessible data to boost the utilisation/acceptance of smart farming technologies	<ul style="list-style-type: none"> <li>Development of high resolution and reliable geospatial data and indicators for applications (e.g. management systems, precision agriculture)</li> </ul>
	Lack of data and data technologies to support climate change adaptation/mitigation efforts and other sustainability objectives in agricultural production	<ul style="list-style-type: none"> <li>Develop or build upon existing data technologies and services to improve agricultural systems to adapt to climate change, contribute to mitigation, increase the resource (water, nutrients) use efficiency</li> <li>Support tools for the quantitative assessment of environmental performances of agricultural systems, to facilitate the uptake of climate friendly (adaptation and mitigation) measures</li> <li>Develop tools for carbon accounting/emission trading mechanisms in agriculture</li> <li>Enhance data and technologies for drought monitoring and forecasting</li> </ul>
	Scarce trust in data sharing (e.g. for sensitive data)	<ul style="list-style-type: none"> <li>Identification of barriers to data sharing</li> <li>Reducing administrative burdens for farmers and stakeholders</li> <li>Develop pseudonymisation/anonymisation techniques to protect farm level or other sensitive data</li> <li>Develop concepts for cross-border sharing of agricultural data between farmers and throughout the value chain</li> </ul>
<b>Policy monitoring/ evaluation</b>	Deficiency of data and digital technologies to assess the effectiveness/performance of land-related policies	<ul style="list-style-type: none"> <li>Development of or alignment with existing data sources and monitoring frameworks to reliably measure and evaluate the effectiveness of agricultural or land-related policy at different scales (landscape, MS, EU)</li> <li>Development of and alignment with existing data infrastructures (e.g. Common Ag. Data space), workflows and tools that enable the compilation, processing and analysis of EU-wide data from administrative sources at MS level (e.g. IACS data from paying agencies based on CAP regulation for IACS data sharing)</li> </ul>

Scope domain of R&I	Current shortage in R&I	R&I perspectives to address shortage
	Lack of data about the state and development of the agricultural landscape/ecosystem and production, including its relation to the major environmental threats (climate change, biodiversity loss, loss of soil fertility, etc.)	<ul style="list-style-type: none"> <li>• Development of or alignment with existing data/indicators/monitoring approaches to reliably characterise the state of the agricultural landscape, production and ecosystems at different scales (landscape, MS, EU)</li> <li>• Support data-based solutions to reduce efforts in reporting obligations</li> </ul>
	Gaps in the geospatial and temporal dimension of EU-wide agricultural statistics	<ul style="list-style-type: none"> <li>• Development of or alignment with existing strategies, infrastructures and tools to integrate statistical, administrative and geospatial/EO data for the generation of consistent and continuous information about status and trends of agricultural production and environmental condition in agricultural landscapes in the EU.</li> </ul>

## **ANNEX IV – Partnership process**

This partnership started its development in Spring 2019 when the idea of contributing to a more sustainable agriculture through the use of digital technologies met with the idea of that better uptake of available Earth and environmental observation data and information would be beneficial in the domain of agriculture. With this, of “Agriculture of Data” was born and later supported by the Shadow Strategic Programme Committee under Horizon Europe to be one of the 49 candidate partnerships under Horizon Europe.

In spring 2020, the first description of the partnership was further developed by DG AGRI and DG RTD into a fiche that was shared with both the Shadow Programme Committee of Cluster 6 and relevant Directorates General (DEFIS, CNECT, JRC, CLIMA, ENV) within the European Commission in Summer 2020.

On the basis of the feedback received, the fiche was adapted and used for wide co-creation and information gathering. Many meetings have taken place between Spring 2020 and end 2021 where the partnership proposal was promoted/presented and feedback was gathered (see below for a detailed overview). This concerns meetings of the Horizon Europe (Shadow) Programme Committee of Cluster 6, the Standing Committee of Agricultural Research (SCAR) and the European High Level Working Group of the Group on Earth Observations (GEO HLWG), as well as thematic meetings in the fields of agriculture, environmental/Earth observations and data/digital technologies. Early April 2021, other relevant Directorates-General in the European Commission (DEFIS, CNECT, JRC, CLIMA, ENV) and the relevant European Agencies (ESA, EEA, EUSPA/GSA and SatCen) were consulted. The partnership has also already been referred to in the Horizon Europe Work Programme 2021/2022.

Due to the pandemic situation, the face-to-face meetings and seminars planned to discuss the partnership with countries representatives and different groups of stakeholders, could not take place. This caused some delays in the further development of the partnership and the set-up of the Core group.

To still ensure co-creation, two large webinars were organised in Spring 2021: On 27/4/2021 a webinar for country representatives took place with around 100 registrations. On 26/5/2021 the second webinar was organised for stakeholders with around 300 registrations. To feed into the webinars, two surveys (one for country representatives and one for stakeholders) were held. These surveys were shortly reopened after the webinars with respectively around 50 and 85 responses received. The surveys delivered a large amount of input considering the needs and preferred specific and operational objectives for the partnership. The surveys also resulted in an overview of a large array of existing initiatives at different levels, which formed an essential cornerstone for stocktaking and gap analyses.

After an informal meeting in July, the Core group started in September 2021 consisting of representatives of 20 countries, nominated by the Cluster 6 Programme Committee of Horizon Europe. These are: Austria, Belgium, Bulgaria, Czech Republic, Denmark (co-chair), Estonia, Finland, France, Germany, Hungary, Ireland, Italy (co-chair), Latvia, Lithuania, The Netherlands, Norway, Poland, Portugal, Slovakia and Spain (co-chair). In addition, 2 ERA-Nets are represented: ERA-PLANET and ICT-AGRI-FOOD after being presenting themselves and being formally accepted by the Core group. The Core group further elaborated the partnership proposal and is developing the Strategic Research and Innovation Agenda (SRIA) on the basis of the fiche and the inputs from the surveys and webinars. It also worked on a gap-analysis with the input of the surveys, identifying where gaps remain in the partnership landscape, worth taking into account in the scope of the partnership.

In December 2021, two more webinars were organised to gather feedback on the intervention logic to be fed into the partnership proposal on the basis of the short background document. For the webinar on 2/12/2021 around 90 country representatives registered and close to 280 registrations were received for the stakeholders’ webinar on 10/12/2021.

The Core group has incorporated the comments in this draft of the partnership proposal dated 31 December.

In Q1/2022, a non-binding questionnaire on possible contributions by countries was circulated or the revision of the partnership document. Even though not all Member States and Associated Countries were in a position to provide a complete response to the questions by mid-March 2022, the result informed the preparation of Section 4.

At that time, it was decided that there will be a need for the organisation of a symposium of partnering countries to fine-tune the resource planning and achieve alignment with the (close to final) SRIA. This symposium is planned to be organised in late summer 2022.

*Overview of Expert Group-, Committee- and Thematic meetings where the partnership was addressed:*

#### **Core group meetings**

15/07/2021 (informal preparatory meeting), 13/09/2021, 20/09/2021, 04/10/2021, 18/10/2021, 02/11/2021, 15/11/2021, 29/11/2021, 13/12/2021, 23/12/2021, 04/01/2021, 12/01/2021

#### **SCAR meetings**

*SCAR Steering group:* 06/05/2021, 9/11/2021

*SCAR Plenary:* 30/06/2021, 07/12/2021

*SCAR informal extended Steering Group (SG) Task Force:* 19/03/2021

*SCAR sub-group on innovation:* 01/06/2021

#### **GEO meetings**

*GEO HLWG:* 12/03/2020, 24/06/2020, 26/10/2020, 12/11/2021

*EuroGEO Workshop:* 22/09/2021

*GEO Week 2021:* 25/11/2021

#### **(Shadow) Programme Committee meeting Cluster 6**

12/05/2020, 25/06/2020, 10/11/2020, 23/04/2021, 14/09/2021

#### **Thematic and other selected meetings**

- Expert Group for Monitoring and Evaluating the CAP (GREXE): 02/09/2020
- 4th NextGEOSS Summit: 9/10/2020
- EO for Agriculture under pressure (ESA-EC): 09/10/2020
- EATIP FORUM - “Digitalisation in aquaculture – from vision to action”: 26/3/2021
- EARSC (European Association of Remote Sensing Companies) EO Cafe: 23/9/2021
- Copa-Cogeca Working group meetings on 09/12/2020, 19/10/2021
- High-Level Group on AI 2021

## **ANNEX V – List of acronyms**

AB	Advisory Board
AC	Associated Countries
ADS	Agriculture of Data Secretariat
AELL	Agro-ecology and Living labs
AgData	Agriculture of Data partnership
AI	Artificial Intelligence
AKIS	Agricultural Knowledge and Innovation System
CAP	Common Agricultural Policy
CEF	Connecting Europe Facility
CL6	Cluster 6 under Horizon Europe
DEFIS	Defence Industry and Space
DEP	Digital Europe Programme
DG	Directorate General of the European Commission
DMP	Data Management Plan
EAFRD	European Agricultural Fund for Rural Development
EC	European Commission
ECB	External Call Board
EEA	European Environment Agency
Eionet	European Environment Information and Observation Network
EIP	European Innovation Partnership
EJP	European Joint Programme
ELMG	European Level Mirror Group
EO	Earth Observation
ERA	European Research Area
ERDF	European Regional Development Funds
ESA	European Space Agency
ESG	Enlarged Stakeholder Group
ET	Executive Team
EU	European Union
EUSPA	European Space Programme Agency
FADN	Farm Accountancy Data Network
FAIR	Findable, Accessible, Interoperable and Reusable
FaST	Farm Sustainability Tool for Nutrient Management
FSDN	Farm Sustainability Data Network
FMIS	Farm Management Information Systems
GA	General Assembly
GB	Governing Board

GEO	Group on Earth Observations
GEO HLWG	GEO High Level Working Group
GEOSS	Global Earth Observation System of Systems
GHG	Green House Gasses
GREXE	Member State Expert Group for Evaluation
GSA	European GNSS Agency
H2020	Horizon 2020
HE	Horizon Europe
IACS	Integrated Administration and Control System
ICB	Internal Call Board
ISAG	Interdisciplinary Scientist Advisory Group
JRC	Joint Research Centre
KCEO	Knowledge Centre for Earth Observation
KPI	Key Performance Indicator
LEAG	Legal and Ethics Advisory Board
MS	Member States
NGO	Non-Governmental Organisation
NLMG	National Level Mirror Groups
OA	Open Access
OD	Open Data
R&I	Research and Innovation
REA	European Research Executive Agency
RRF	Recovery and Resilience Facility
RPO	Research Performing Organisation
PC	Programme Committee under Horizon Europe
SatCen	European Union Satellite Centre
SCAR	Standing Committee for Agricultural Research
SDG	Sustainable Development Goal
SME	Small and Medium Enterprises
SRIA	Strategic Research and Innovation Agenda
TRL	Technology Readiness Level
WG	Working Group